US Army Corps
of Engineers
Alaska District

Public Notice of Application for Permit

Regulatory Branch (1145b)
Post Office Box 6898
Elmendorf AFB, Alaska 99506-6898

PUBLIC NOTICE DATE: **3 April 2006**

EXPIRATION DATE: **3 May 2006**

REFERENCE NUMBER: **POA-2005-389-M**

WATERWAY NUMBER: **Moose Creek**

Interested parties are hereby notified that an application has been received for a Department of the Army permit for certain work in waters of the United States as described below and shown on the attached plan.

APPLICANT: Chickaloon Village Traditional Council, Post office Box 1105, Chickaloon, Alaska 99674: contact Ms. Jessica Dryden, Project Coordinator, telephone number 1-(907) 745-0737.

LOCATION: Section 33, T. 19 N., R. 2 E., Seward Meridian, in the waters of Moose Creek, Alaska, Latitude: 61.6995; Longitude: 149.0955, between Palmer and Sutton, and north of the Glenn Highway.

WORK: Remove approximately 12,000 cubic yards of native materials, and place approximately 12,000 cubic yards of fill materials, including woody debris below the ordinary-high-water line, into approximately 5.8 acres of waters of the U.S.

PURPOSE: To re-establish fish passage, and physical and biological function of the stream channel.

ADDITIONAL INFORMATION: Approximately 250,000, cubic yards of material will be disturbed during the construction of this project, impacting approximately 6.0 acres. However, this disturbance will in the end yield an increase in fish and wildlife habitat in the project area. This project is being done with a grant provided by the U.S. Fish and Wildlife Service (USFWS). USFWS has approved the overall plan for this enhancement project. This is a modification of the permit POA-2005-399-4, Moose Creek, issued in 2005 for phase I of this project.

MITIGATION: No further mitigation will be required for the proposed project, as it will increase wetlands and waters of the U.S., and provide more and improved habitat for a species of national interest.

WATER QUALITY CERTIFICATION: A permit for the described work will not be issued until a certification or waiver of certification as required under Section 401 of the Clean Water Act (Public Law 95-217), has been received from the Alaska Department of Environmental Conservation.

COASTAL ZONE MANAGEMENT ACT CERTIFICATION: Section 307(c)(3) of the Coastal Zone, Management Act of 1972, as amended by 16 U.S.C. 1456(c)(3), requires the applicant to certify that the described activity affecting land or water uses in the Coastal Zone complies with the Alaska Coastal Management Program. A permit will not be issued until the Office of Project Management and Permitting, Department of Natural Resources has concurred with the applicant's certification.

PUBLIC HEARING: Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state, with particularity, reasons for holding a public hearing.

CULTURAL RESOURCES: There are unevaluated properties in the vicinity of the worksite. Because the properties have been determined to lie within the project area, a determination of eligibility and, if needed, a determination of effect will be made in consultation with the State Historic Preservation Officer (SHPO). Consultation of the AHRS constitutes the extent of cultural resource investigations by the District Engineer at this time. This application is being coordinated with SHPO. Any comments SHPO may have concerning presently unknown archeological or historic data that may be lost or destroyed by work under the requested permit will be considered in our final assessment of the described work.

TRIBAL CONSULTATION: The Alaska District fully supports tribal self-governance and government-to-government relations between the Federal government and Federally recognized Tribes. This notice invites participation by agencies, Tribes, and members of the public in the Federal decision-making process. In addition, Tribes with protected rights or resources that could be significantly affected by a proposed Federal action (e.g., a permit decision) have the right to consult with the Alaska District on a government-to-government basis. Views of each Tribe regarding protected rights and resources will be accorded due consideration in this process. This Public Notice serves as notification to the Tribes within the area potentially affected by the proposed work and invites their participation in the Federal decision-making process regarding the protected Tribal right or resource. Consultation may be initiated by the affected Tribe upon written request to the District Engineer during the public comment period.

ENDANGERED SPECIES: No threatened or endangered species are known to use the project area.

Preliminarily, the described activity will not affect threatened or endangered species, or their critical habitat designated as endangered or threatened, under the Endangered Species Act of 1973 (87 Stat. 844). This application is being coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Any comments they may have concerning endangered or threatened wildlife or plants or their critical habitat will be considered in our final assessment of the described work.

ESSENTIAL FISH HABITAT: The proposed work is being evaluated for possible effects to Essential Fish Habitat (EFH) pursuant to the Magnuson Stevens Fishery Conservation and Management Act of 1996 (MSFCMA), 16 U.S.C. et seq and associated federal regulations found at 50 CFR 600 Subpart K. The Alaska District includes areas of EFH as Fishery Management Plans. We have reviewed the January 20, 1999, North Pacific Fishery Management Council's Environmental Assessment to locate EFH area as identified by the National Marine Fisheries Service (NMFS).

We have determined that the described activity within the proposed area will not adversely affect EFH, including anadromous fish and federally managed fishery resources. In the early stages of the proposed project some habitat will be lost, but will be replaced and considerably added too by the final product.
SPECIAL AREA DESIGNATION: None.

EVALUATION: The decision whether to issue a permit will be based on an evaluation of the probable impacts including cumulative impacts of the proposed activity and its intended use on the public interest. Evaluation of the probable impacts, which the proposed activity may have on the public interest, requires a careful weighing of all the factors that become relevant in each particular case. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. The decision whether to

authorize a proposal, and if so, the conditions under which it will be allowed to occur, are therefore determined by the outcome of the general balancing process. That decision should reflect the national concern for both protection and utilization of important resources. All factors, which may be relevant to the proposal, must be considered including the cumulative effects thereof. Among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people. For activities involving 404 discharges, a permit will be denied if the discharge that would be authorized by such permit would not comply with the Environmental Protection Agency's 404(b)(1) guidelines. Subject to the preceding sentence and any other applicable guidelines or criteria (see Sections 320.2 and 320.3), a permit will be granted unless the District Engineer determines that it would be contrary to the public interest.

The Corps of Engineers is soliciting comments from the public; Federal, State, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Comments on the described work, with the reference number, should reach this office no later than the expiration date of this Public Notice to become part of the record and be considered in the decision. Please contact **Mr. Skip Joy** at (907) 753-2716/2720/2724 (Juneau 790-4490)(Fairbanks 474-2166), toll free from within Alaska at (800) 478-2712, or by email at irvin.t.joy@poa02.usace.army.mil if further information is desired concerning this notice.

AUTHORITY: This permit will be issued or denied under the following authorities:

( ) Perform work in or affecting navigable waters of the United States – Section 10 Rivers and Harbors Act 1899 (33 U.S.C. 403).

(**X**) Discharge dredged or fill material into waters of the United States – Section 404 Clean Water Act (33 U.S.C. 1344). Therefore, our public interest review will consider the guidelines set forth under Section 404(b) of the Clean Water Act (40 CFR 230).

( ) Transport dredged material for the purpose of dumping it into ocean waters - Section 103 Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1413). Therefore, our public interest review will consider the criteria established under authority of Section 102(a) of the Marine Protection, Research and Sanctuaries Act of 1972, as amended (40 CFR Parts 220 to 229), as appropriate.

A plan, Notice of Application for Certification of Consistency with the Alaska Coastal Management Program, and Notice of Application for State Water Quality Certification are attached to this Public Notice.

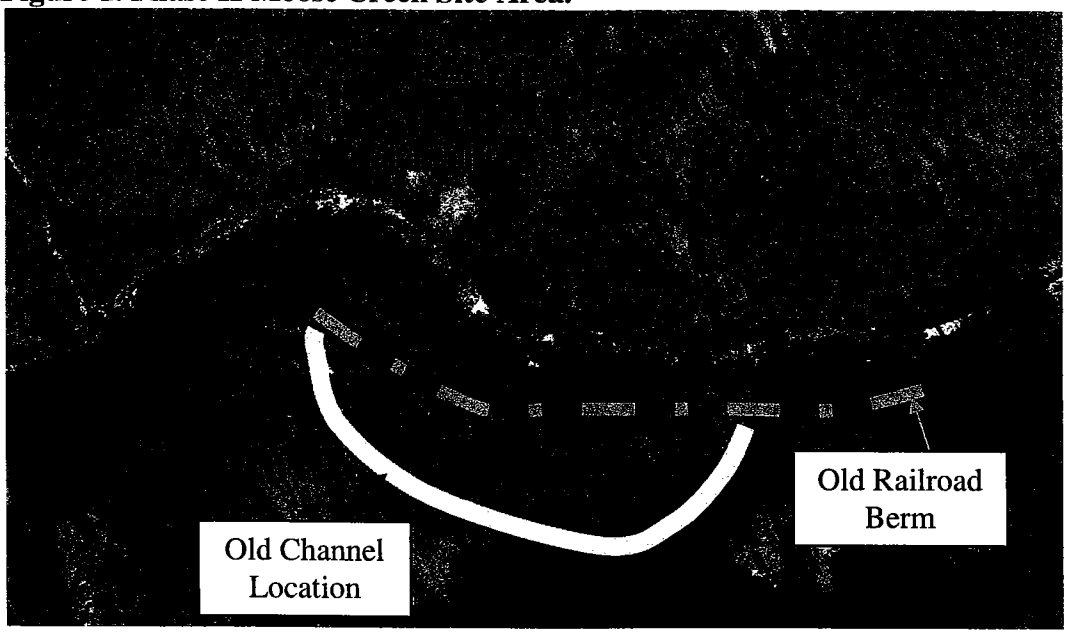
District Engineer
U.S. Army, Corps of Engineers

Attachments

INTRODUCTION

This report details alternatives, design considerations and construction activities for Phase II of Moose Creek Fish Passage Restoration Project (Figure 1). Phase I, completed in 2005, returned a section of the creek to its near historic pattern and re-opened fish passage to upstream habitats that had otherwise been completely inaccessible to salmon due to a large waterfall. Implementation of Phase II will complete the removal of the most significant barriers to fish passage created by past development on Moose Creek. This report builds upon the results documented in the 2004 report "Conceptual Restoration Plan – Moose Creek" by Christopher Roach, P.E., subsequent field investigations and Phase I construction efforts.

Figure 1. Phase II Moose Creek Site Area.



PROBLEM DESCRIPTION

Moose Creek was re-routed at several locations in the early 1900's to facilitate construction of a railroad line for transporting coal. Additional impacts resulted from coal mining activities at several sites in the Moose Creek valley. Channel alignment changes and related impacts resulted in the formation of several distinct waterfalls and a significant loss of in-stream aquatic habitat. The upper waterfall located in Reach 3 (Roach, 2004) was a complete barrier to upstream fish migration, and the creek was diverted around the waterfall by restoration construction activities in 2005 to facilitate fish passage. The lower several waterfalls located in Reach 5 (Roach, 2004) are an impediment to migration of mainly juvenile salmon, and it has been observed by local residents that there are much fewer salmon upstream of these waterfalls. Phase II will restore Reach 5 by bypassing these waterfalls and providing complete fish passage to upstream wetland complexes.

OBJECTIVES

Objectives for Phase II restoration are to:

1) Establish fish passage conditions similar to undisturbed or reference reaches in the creek
2) Provide additional in-stream spawning habitat
3) Provide a more stable creek dimension, plan and profile with increased floodplain capacity for long-term functionality of creek and to better ensure fish passage in the future.

PROBLEM DESCRIPTION

The 2006 work scope involves restoring Moose Creek to a stable dimension, pattern and profile adjacent to the waterfalls (Figure 1). The morphology of a stable reference reach and historic channel alignment were used as the basis for the characteristics of the realigned reach. A longitudinal profile and drawings are included. Project layout will be adjusted on-site to accommodate local conditions.

The waterfalls will be bypassed by re-aligning and re-constructing the channel and floodplain close to their historic location, which was moved during past railroad and mining activity. New channel location will be kept away from steep slopes as much as possible. The objective is construction of a new C-stream type channel with a high width to depth ratio and a well-developed floodplain.

In-stream structures will be included for grade control, bank protection, and as funding and ability allows for micro-pool construction and habitat diversity. Structures will be constructed using materials available on site. These structures consist of a stream rib, J-hook vanes, constructed log jams and boulders. The stream ribs will be used for grade control; J-hook vanes will be used for bank protection, pool formation and increased habitat diversity; constructed log jams will provide refuge areas during floods; and the boulders will be used to enhance habitat diversity by creating small scour pools and areas for gravels to persist and fish to rest.

Most of the new channel construction will be completed "in-the-dry", except for tie-ins to the existing channel at the upstream and downstream locations. After new channel construction, J-hooks, stream rib and log jams are installed and the flow diverted, the existing channel will be filled to under the flood prone elevation (maximizing floodplain for the 100-year event), and the last J-hook vanes constructed at the tie-in areas. The banks and disturbed areas will then be re-vegetated. Re-vegetation will include planting dormant felt-leaf willows and seeding with a mix of annual and perennial grasses.

OTHER ALTERNATIVES CONSIDERED

Alternatives considered were:

1) Do Nothing. This would leave the stream channel as-is with the waterfalls. Current conditions are a significant barrier to upstream migration of adult and juvenile salmon, and the increased slope and velocities of the re-routed channel will only make the waterfalls more significant barriers over time. For these reasons, this alternative was ruled out.

2) Re-Design with In-Stream Step-Pools. This construction would keep the stream in its current location and distribute the drops at waterfalls over a longer distance to form a step-pool channel. This plan would require extensive in-stream work and much more effort than bypassing the waterfalls, and would provide less habitat value. There is also the risk of a large flood removing the step-pools, as the stream is mainly on bedrock in this site. For these reasons, Alternative 2 was ruled out.

3) Bypass Alternatives: Several bypass alternatives were considered using existing topography, excavation volumes, constructability and cost. The current design balances these factors to achieve the objectives of returning the channel to more natural design ratios, restoring fish passage and improving in-stream habitat.

LAND OWNERSHIP
Land ownership is the State of Alaska.

PHASE TWO CURRENT CONDITIONS
The Roach, 2004 report specifies the Phase II site (Reach 5 in the report) as the lower waterfall reach, which had been rerouted in association with railroad construction. It states:

"Two bedrock-controlled waterfalls are located within this reach; the upper falls has a vertical drop of approximately 2.5 feet and the lower approximately 3.5 feet. These two waterfalls are an impediment to upstream migration of fish, but are not a complete blockage. In addition to the two waterfalls, this reach is characterized by a loss of floodplain function, loss of instream spawning habitat, and high velocities within the channel, resulting from bed degradation (downcutting) and construction dikes along the channel boundary. The original channel meander bend is still present, although it has been altered by railroad construction."

Figure 1 shows the locations of these two waterfalls, as well as the old channel and railroad berm. A third small waterfall was observed during investigations in fall, 2005, with a vertical drop of approximately one foot and high water velocity due to extreme bedrock constriction. Figure 2 documents each of the three waterfalls.

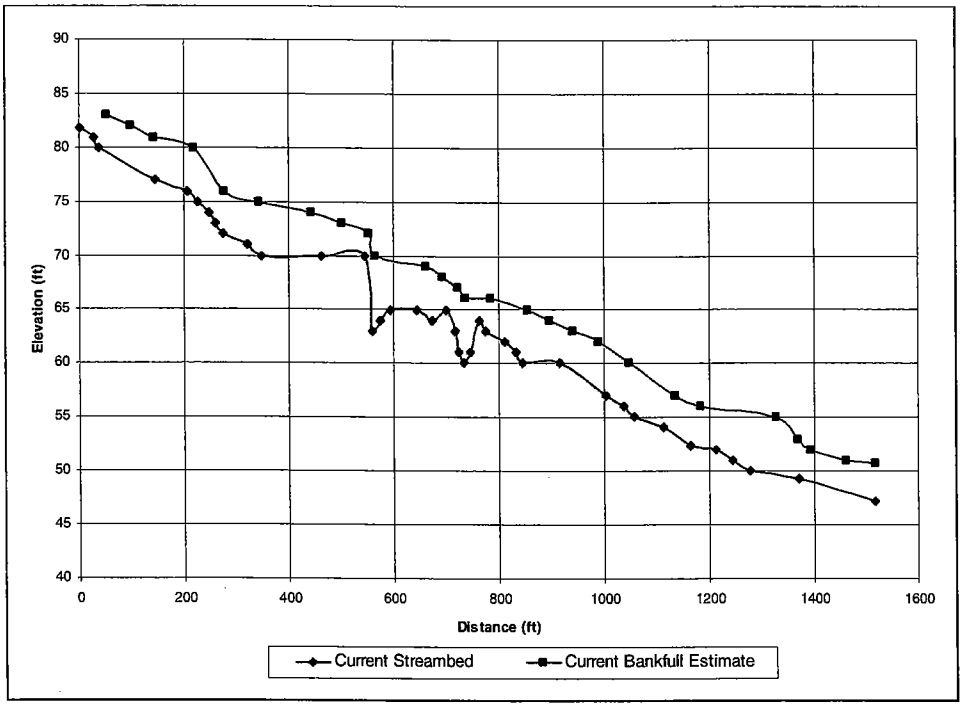
Figure 2. Waterfalls in Phase 2 – September, 2005.

Waterfall 1 **Waterfall 2** **Waterfall 3**

Field investigations by the US Fish and Wildlife Service and Chickaloon Village Traditional Council in fall of 2005 focused on re-verifying the existing stream profile from 2004 to note any significant changes and obtaining topography for alternative designs. No significant changes occurred from 2004 to 2005 within the channel. The 2005 channel profile is shown as Figure 3.

Observations of the original pre-development alignment of the creek indicated it was along the west side of the floodplain against a steep hill (Roach, 2004). This hill is subject to erosion and sloughing of rocks into the floodplain area, and so creek design will keep the active channel at least 50 feet from the toe of the slope.

Figure 3. Phase II Profile



PHASE II REFERENCE CONDITIONS, MODELING AND DESIGN

Reference reaches were delineated by Chris Roach in 2004 (Roach, 2004) for representative pool, riffle and glides, and are shown in Table 1. Phase 1 restoration efforts modified these values for change in slope and to emulate similar shear stress on the banks.

The design parameters for Phase II are listed in Table 2. The methodology used to develop the design parameters for Phase II and comparisons of pre and post construction values for Phase I are presented in more detail in Attachment 1. For Phase II, reference pool and riffle dimensions were used. Figure 4 shows Riffle 1, a typical cross-section design for the straight sections between meanders. Figure 5 shows Riffle 2, a typical cross-section design through the meander bends. The variation in Riffle 2 consists of a 1H:10V sloped section approximately 1.0 to 1.5 feet below bankfull taken out of the inside meander bend side of the cross-section. This section is created to promote point bar formation on the inside of the meander bends, as well as help relieve stress produced

by the log vane habitat structures. Facilitating point bar formation will also help sort gravels to promote spawning gravel areas, as well as allow the point bar to form its own elevation and shape.

Meanders were also evaluated by using recent orthophotos of Moose Creek and the program RiverMorph to estimate select pre-development meander pattern variables for design, and are shown in Table 2.

Table 1. Reference Reach and Phase 1 Information

Type	XS1200	XS1300	XS1800	XS1900	Avg.
Bankfull	Pool	Glide	Pool	Riffle	
Area	101	92	131	103	107
Width	41	39	47	41	42
Depth	2.5	2.3	2.8	2.5	2.5
Width/Depth	16	17	17	17	17
Max. Depth	4	3.4	4	3.4	3.7
2x Max. Depth	8.1	6.7	8	6.8	
Width (FPW)	95	89	250	250	
Entrenchment Ratio	2.3	2.3	5.3	6.1	4.0
Bed Material	Gravel	Gravel	Gravel	Gravel	
Stream Type	C4	C4	C4	C4	

Table 2. Design Parameters for Phase II.

Type	Design Riffle 1	Design Riffle 2
Bankfull		
Area	114	114
Width	44	56
Depth	2.6	2.6
Width/Depth	17	21.5
Max. Depth	3.4	3.4
2x Max. Depth	6.8	6.8
Width (Flood Prone Width)	Min 150 ft.	Min 150 ft.
Meander Wavelength –Min.(740 ft.) Avg.(1040 ft.), Max(1575 ft.)	830	
Radius of Curvature – Min.(150 ft.) Avg.(240 ft.) Max (365 ft.)	Meander 1,2,3 (starting upstream) 360/280/300 (ft.)	

Note: In Riffle 2, the cross-section does not change from Riffle 1 except for the cut for point bar formation, widening the creek.

Figure 4. Riffle 1 Typical Cross-Section

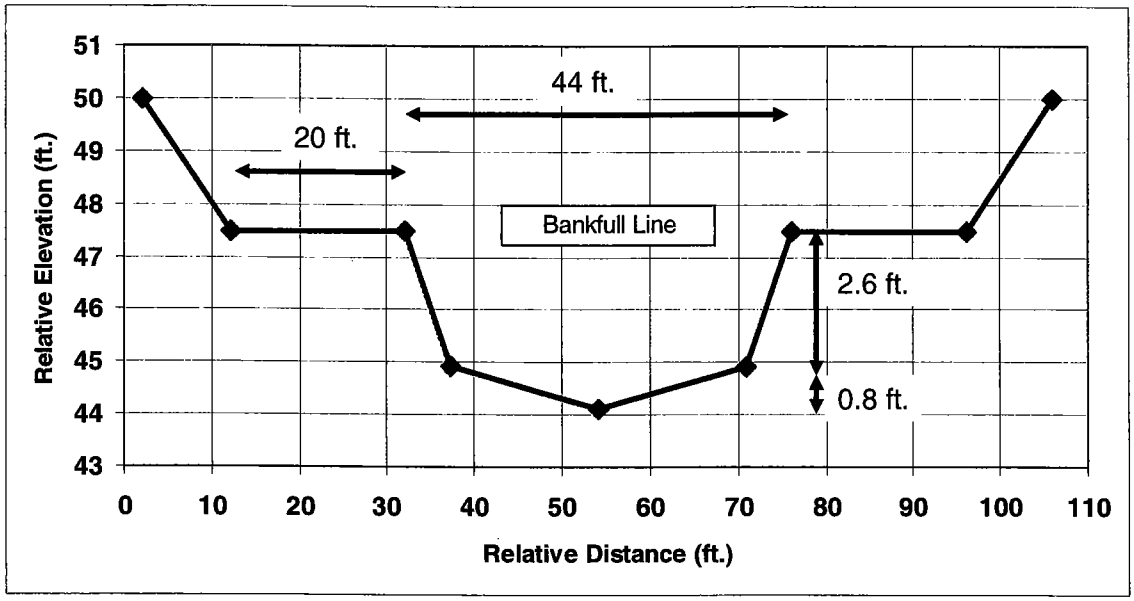
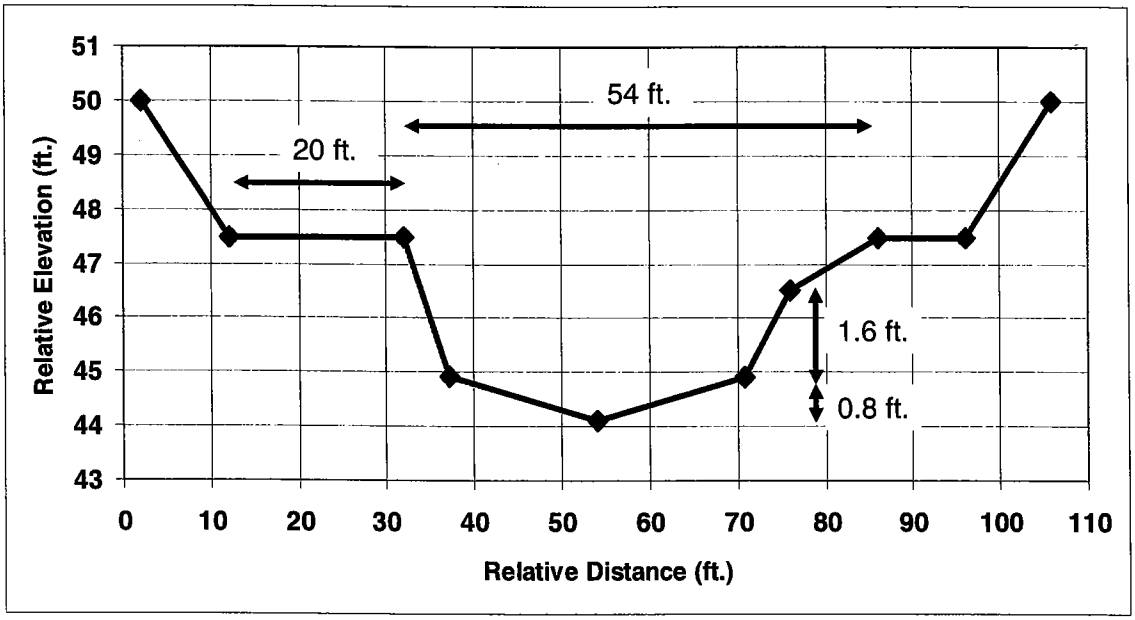


Figure 5. Riffle 2 Typical Cross-Section



Riparian Area

The riparian area within the existing floodplain is composed of alder and willows. The historic floodplain in this area outside the railroad berm is composed of mainly mature cottonwood and birch, spaced 15-20 feet apart, with willow and low-lying bushes interspersed throughout.

OTHER ISSUES

Navigation Issues

Moose Creek is used for navigation by recreational whitewater kayakers. This project will impact navigation during and following construction as follows:

- The "wilderness experience" for whitewater paddlers will be interrupted at the project site by the presence of construction equipment. Construction duration is anticipated to be approximately 2 months.

- During "tie-in" of the new channel alignment, navigation of the channel will be interrupted as the old channel is blocked off and the water is diverted to the new channel. At that time paddlers will be instructed to pull out upstream of the project site and carry their craft around the construction activity. This phase is anticipated to last approximately one week.

- Following construction the channel morphology will be altered from its current condition, by eliminating the waterfalls and forming riffle-pool morphology with a consistent gradient.

Channel Conveyance and Flood Stage Issues

This project will not impact flood capacity. The new channel alignment will closely follow the historic channel alignment. Due to down-cutting of the channel in Reach 5 and the proximity of the elevated railroad bed, much of the new alignment area is not currently subject to flooding. Once the new channel is tied-in, most of the valley bottom will be within the floodplain, and therefore subject to flooding at high flows. There is no existing or planned development or infrastructure within the valley bottom, so there is no anticipated flood impact from this change.

CONSTRUCTION

Almost all of the construction is expected to be performed "in-the-dry", with new channel construction completely away from the existing creek except for the tie-in locations upstream and downstream. J-hooks, and log jams will also be constructed prior to the introduction of flow. The stream rib and one or two J-hooks are likely to be installed "in-the-wet" as they are located at the tie-in points.

Access and Other Construction Considerations

Construction is necessarily limited by the unique location of the site. It is expected that access will be from a downstream point near the project. River rock and other materials for channel construction and channel fill will be limited to what is available on site. Willows can be obtained locally or brought in. One option for regular fuel delivery to the heavy equipment is to use a day-tank (approx. 300 gallons) mounted in the bed of a tracked vehicle, which can negotiate a steep hill down to the project site. A similar day tank will be mounted in a pickup truck bed for delivery to the tracked vehicle at the top of the hill. A second option is to run a fuel line from the top of the creek canyon (west of the project) down a hill to the project site, and include associated safety measures for spill containment. These options will be coordinated with the applicable State agencies.

Equipment Requirements

Anticipated construction equipment is listed below (equivalent can be used). Equipment may be operating in water and crossing the stream during the construction process.

- Cat 330-C Track hoe
- Volvo 825 Off-Highway Truck (6-wheel drive large tire end-dump)
- 1 Bombardier Track Vehicle (under 5,000 lb. GVW for access and fueling)
- D7 Cat Bulldozer or a D6/D8 (depending on availability)

Best Management Practices will be used in accordance with State regulations. Silt fence will be installed along disturbed areas that may contribute directly to the stream. Stream diversion will occur to maximize dilution of sediment during the initial flow in the new channel. Fueling and maintenance will occur at designated sites and away from the creek. Stream crossings will be minimal, and are expected only for servicing vehicles, as all material excavation will be moved to the north side of the new channel prior to stream diversion. After stream diversion to the new channel, all earth movement will occur on the north side of the project site to fill in the old channel.

DESIGN DRAWINGS

Figure 6 compares current channel with new channel profile based on 2005 topographic survey. A conceptual plan view of the design is shown on Figure 7.

Figure 6. Phase II Profile

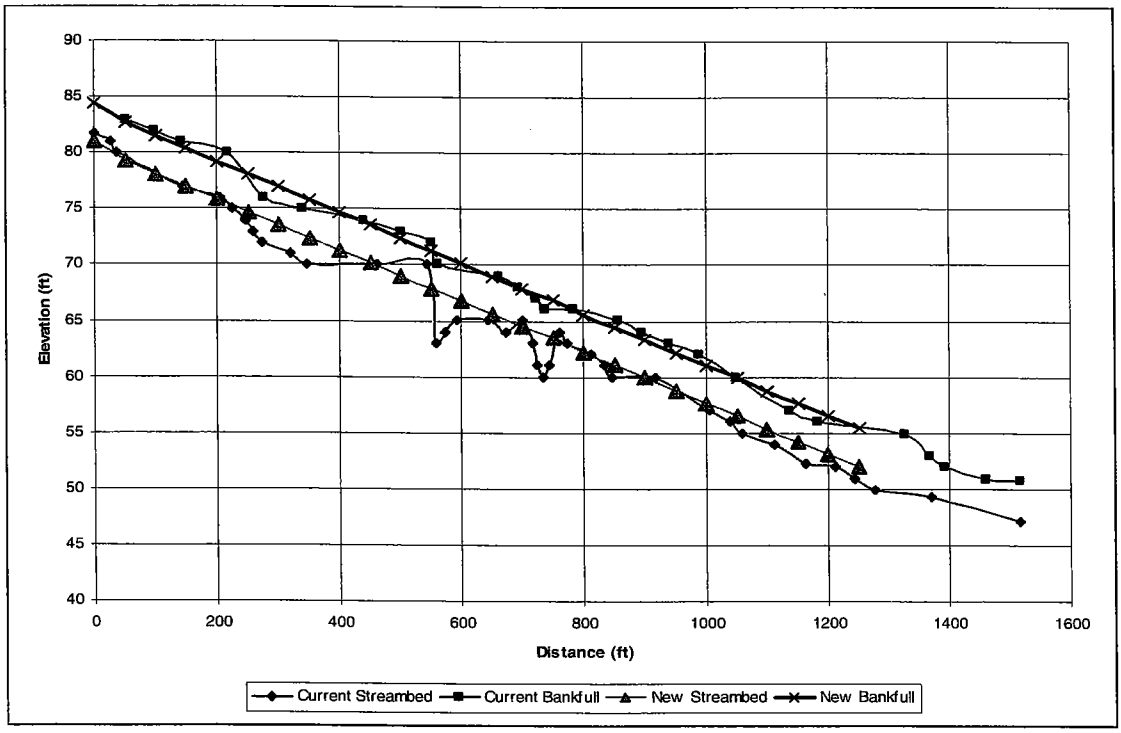
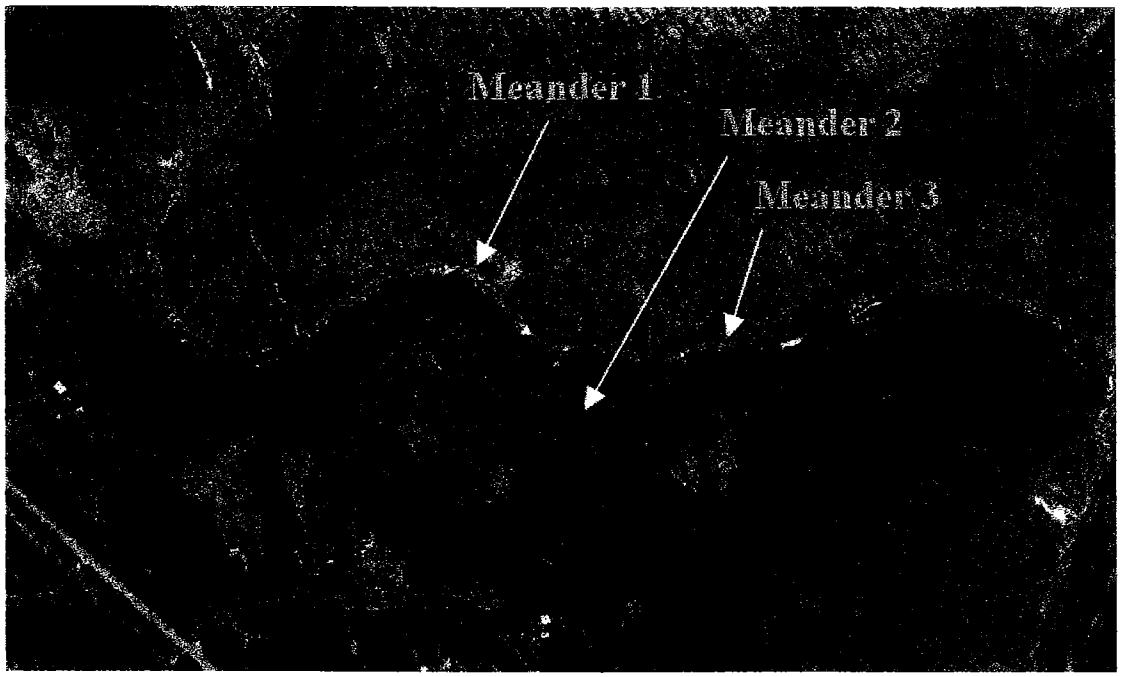


Figure 7. Plan View of Design.



Grade Control

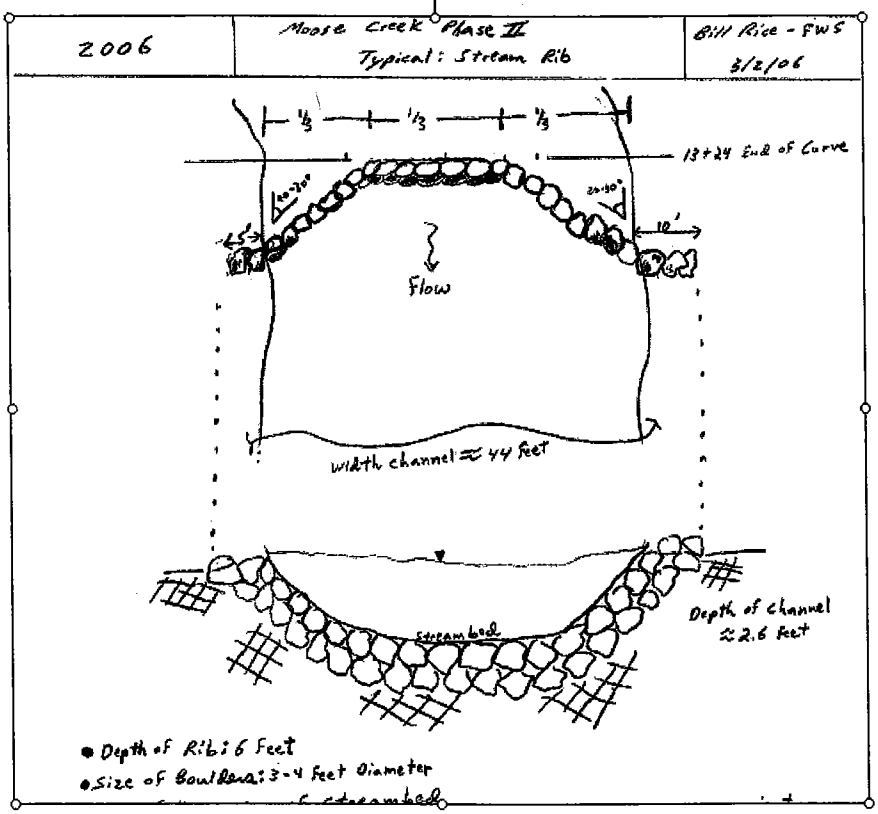
One stream rib is to be constructed on the downstream end of the project where the new alignment ties-in with the existing channel. This structure is similar to a cross-vane structure, except the top of it follows the top of the streambed – essentially a buried cross-vane. This structure was selected since only grade control is needed, and the location of the tie-in is not an ideal location for a pool structure in Moose Creek. Generic design is as shown in Figure 8, with footer depths and boulder sizes as listed for vanes in Table 4. This structure will be formed completely of rock, with footer depths 6 feet below thalweg and rock size a minimum 3.8 feet diameter.

Table 4. Vane Design Parameters for Each of the Three Designed Meander Bends

Parameter	Meander 1 Upstream End	Meander 2	Meander 3 Downstream End
Location	Start with vane in lower 1/4 of each meander and then place next one as per J-Hook Vane Design Procedure.		
Meander Radius	360	290	365
Barb Length (in channel) **Barb Length (key-in)**	60-68 feet 10-16 feet	60-68 feet 10-16 feet	60-68 feet 10-16 feet
Horizontal Angle	20-25 degrees from bank looking upstream		
Width	3-4 feet at end in channel		
Barb Slope	2-7%		
Expected Hydraulic Head **Expected Scour Depth (below tailwater elev.)**	0.5 feet 5 feet	0.5 feet 5 feet	0.5 feet 5 feet
Footer Depth	+5 feet	+5 feet	+5 feet
Boulder Size for Vanes (For Wood Anchors)	3.8 feet diameter minimum (5.7 feet diameter minimum)		
Number of Vanes	4	4	1

Note: Calculations used from Rosgen, et.al, 1996. The Cross-Vane, W-Weir and J-Hook Vane Structures...Their Description, Design and Application for Stream Restoration and River Stabilization.

Figure 8. Cross-Vane Generic Design



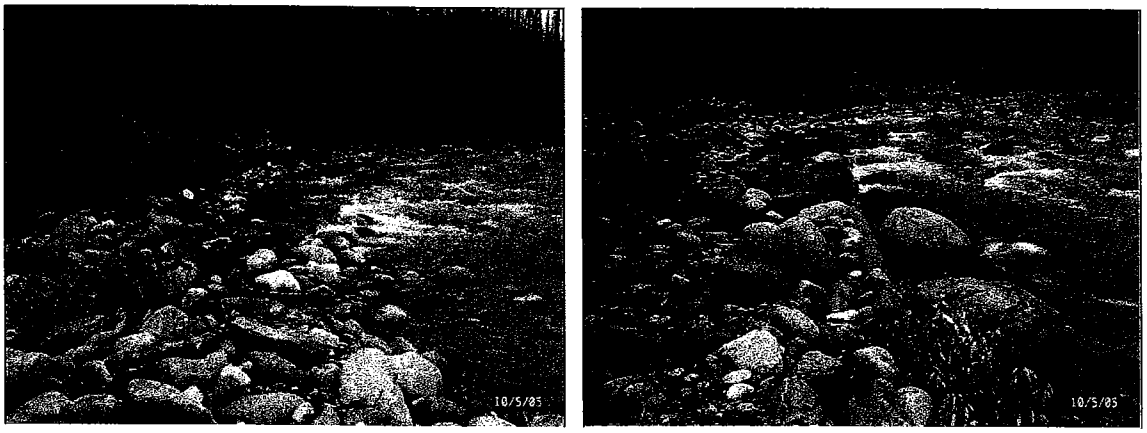
Adapted from Rosgen, 1996 and U.S. Forest Service restoration practices.

Habitat Enhancement Features
Rerouting the creek around this series of waterfalls will result in more juvenile fish passage and will be an enhancement in and of itself. The project will also incorporate additional features as time and funding allow. These features are:

- J-hook vanes (provide velocity change and small pools along meander bends)
- Boulder placement (consistent with natural character of creek for small resting and spawning areas)
- Constructed logjams (in key spots for additional habitat cover and for refuge during flood events)

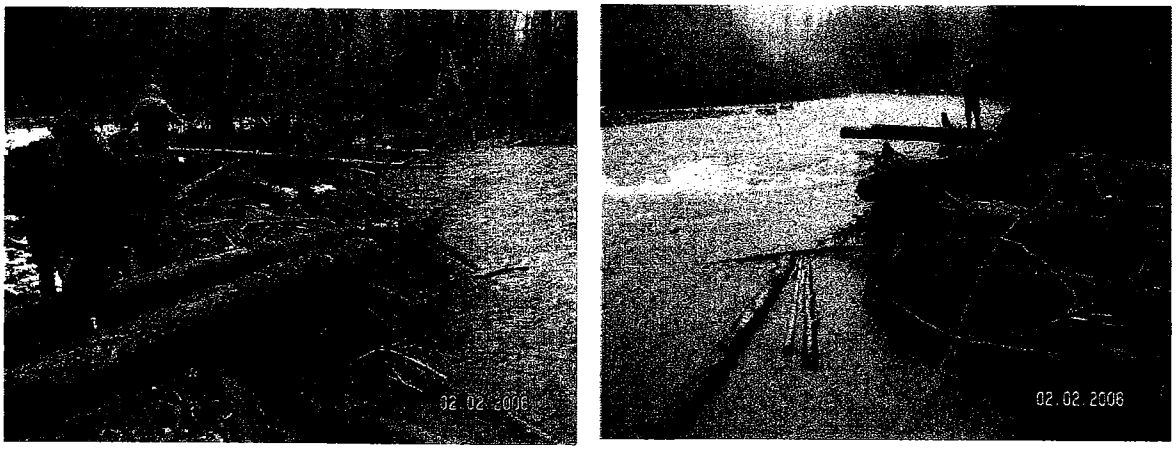
Vanes will be incorporated into the new meanders to provide some habitat diversity and additional bank stability, as shown in Phase I construction of Moose Creek (Figure 9). Location and construction will be according to Rosgen and NRCS standards and use mainly wood, the most available material at the site. Phase I construction noted insufficient large boulders on-site for rock construction of vanes. Table 4 has the vane design parameters.

Figure 9. Phase I Wood Vane Construction on Moose Creek.



Constructed Logjams
As time and ability allows, up to three constructed logjams will be part of the project. These logjams are based on NRCS design as well as designs by Brian Bair with the US Forest Service in Washington (Figure 10). One potential location is on the downstream quarter of Meander #2, projecting 5 feet into the river and built up onto the floodplain above the 100-year event stage. The second two locations are at a bedrock pinch-point in the middle of the current creek reach and near the upstream tie-in point, and again, built up above the 100-year event stage. These locations, while not providing much in-stream habitat for below bankfull stage, will provide lower velocity areas and refuge for juveniles during larger flood events.

Figure 10. Examples of Constructed Logjams in Washington.



Material Volumes

This project will involve cut and fill both above and below Ordinary High Water (OHW). Cut will be derived from material removed for excavation of the new channel and floodplain (gravel, brush, organics). Fill will be derived from material placed in abandoned channel areas, the floodplain and current uplands, and material placed for in-stream structures (rocks, trees, and root wads). Currently estimated material volumes are contained in Table 5.

Table 5. Estimated Material Volumes for Phase II.

Type	Estimated Amount
Total Cut/Fill Balance Estimate	12,000 CY
- Amount Cut Below OHW	5,000 CY
- Amount Cut Above OHW	7,000 CY
- Amount Fill Below OHW	4,700 CY
- Amount Fill Above OHW	7,300 CY

Preliminary Construction Sequence

The anticipated sequence of activities for the project construction is outlined below. The final project sequence will be developed to accommodate local conditions at the time of construction, input from permitting agencies, construction contractor and other factors as necessary.

Pre-Construction Survey and Site Clearing/Layout (About 2 weeks duration): Prior to construction start, a pre-construction survey will be conducted to verify and finalize profile of the design bypass channel; dig test pits to verify soils and any potential bedrock outcrops; final channel dimensions; and verify local site conditions.

New Channel and Floodplain Excavation (About 3 weeks duration): The new channel and floodplain will be excavated to finish grade along the length of the new alignment. Material excavated from the new channel will be used as fill or stockpiled as necessary for the channel tie-ins and for filling the old channel. Floodplain area will also be shaped. All material for constructing in-stream structures will be staged at each structure location.

Build New Structures (About 1 week duration): In-channel structures will be constructed throughout the project reach. Structures will primarily be built "in the dry" throughout the new channel.

Channel Tie-In (About 1 week duration): Two tie-ins will be required – at the upstream and downstream ends of the new alignment. Tie-ins will be done starting with the downstream tie-in. The last tie-in will be at the upstream end of the project to divert flow into the new channel. Once all the water is shifted to the new channel, the channel and floodplain fill and final grading will be finished throughout the new channel alignment, requiring multiple crossings of the new channel with equipment.

Re-Vegetation and Adjustments (About 1 week duration): Site will be revegetated, any adjustments in in-stream projects performed, and site will be closed out.

ATTACHMENT 1
Design Parameter Determinations for Phase II

The Phase 1 restoration efforts in 2005 used the values in Table 1 design column. Although the bankfull area was similar to reference conditions, overbank flow was still experienced when water was diverted into the channel, without significant observed precipitation.

Factors that may have caused this are:

- Constructed streambed 0.4 feet higher to accommodate expected streambed consolidation - but consolidation was insignificant
- Use of reference reaches that are of less slope (although this would likely have decreased the stage height)
- Increased roughness with boulders and vanes within channel

Table 1. Reference Reach and Phase 1 Information

Type	XS1200	XS1300	XS1800	XS1900	Avg.	Phase 1	Phase 1
Bankfull	Pool	Glide	Pool	Riffle		Design*	Const.
Area	101	92	131	103	107	110	113
Width	41	39	47	41	42	48	51.4
Depth	2.5	2.3	2.8	2.5	2.5	2.3	2.2
Width/Depth	16	17	17	17	17	17.1	23.4
Max. Depth	4	3.4	4	3.4	3.7	2.8	2.5
2x Max. Depth	8.1	6.7	8	6.8			5.0
Flood Prone Width	95	89	250	250			
Entrenchment Ratio	2.3	2.3	5.3	6.1	4.0		
Bed Material	Gravel	Gravel	Gravel	Gravel		Gravel	Gravel
Stream Type	C4	C4	C4	C4		C4	C4

Note: Phase 1 design estimates from permit application cross-sections.

During construction, banks were raised about 1 foot higher to keep flow within the bankfull dimension.

Bankfull was re-evaluated in Reach 5 in fall of 2005. FWS field investigations for Reach 5 found potential bankfull indicators that varied up to 1-foot compared to the values in Table 1, however, subsequent modeling of the riffle cross-section XS-1900 at a 2.1% slope and 2-year flow event indicated that either are within the error present for hydrologic modeling of the system (Table 2).

Table 2. Hydrologic Modeling Results

Type	Value
Watershed Area	42 sq. miles
Precipitation Avg.	40 inches
% Lakes	1%
2-year flow est. (cfs)	640
95% Confidence Interval	330-1240
100-year flow est. (cfs)	2080
95% Confidence Interval	1050-4130
Elevation of Bankfull (BF)	2.5
Model BF Elevation of 2-year Flow (HEC-RAS)	1.4-2.1-3.34

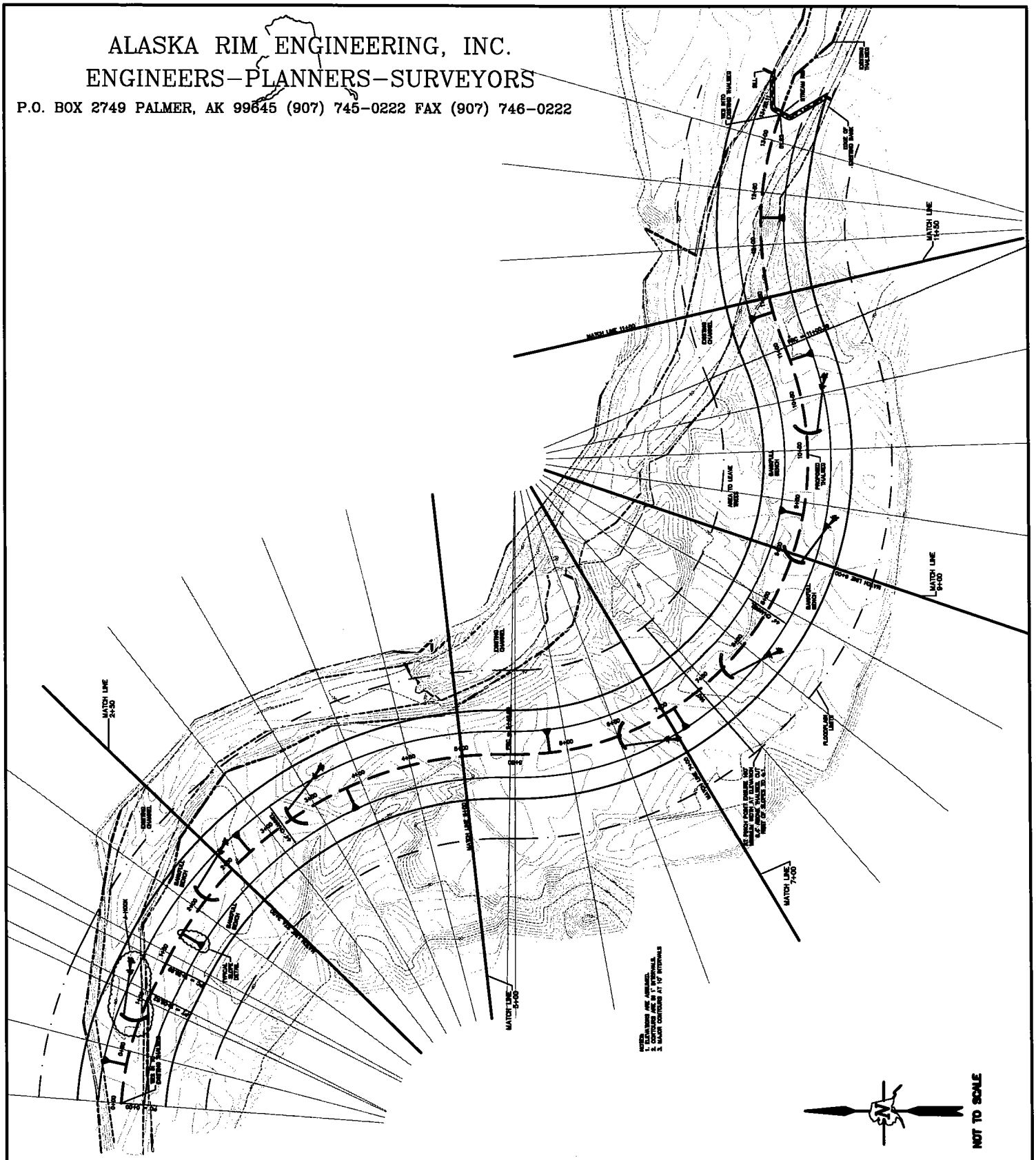
Note: The 2 and 100-year flows result from USGS publication 03-4188 "Estimating the Magnitude and Frequency of Peak Streamflows for Ungaged Sites on Streams in Alaska and Conterminous Basins in Canada, 2003."

Additionally, observed bankfull estimates and daily peaks tend to indicate that the 2-year event is higher than modeled averages. Modeled 2-year flow results compared to three years of USGS gage data on Moose Creek show that the 2-year flow estimate of 640 cfs from modeling is within the recorded daily mean streamflow peaks (between 400-800 cfs) for period of record, however, these are not instantaneous peaks values, which would be higher and more comparable than daily mean streamflow. This would also suggest that the 2-year flow may be higher than the average 2-year event estimated.

To better resolve a flow value, a comparison was made to the Little Susitna USGS gage at the entrance to Hatcher Pass. The watershed has similar characteristics to the Moose Creek drainage. With a watershed of 61.9 square miles, it's 2-year flow was 1820 cfs and 100-year flow 6,220 cfs. Using a unit area method to correlate to Moose Creek, the project area 2-year flow is estimated to be about 1235 cfs and 100-year flow about 4220 cfs.

Comparison to the Little Susitna USGS gage was used for 2-year bankfull and 100-year flood modeling of Moose Creek Phase II.

ALASKA RIM ENGINEERING, INC.
ENGINEERS–PLANNERS–SURVEYORS
P.O. BOX 2749 PALMER, AK 99645 (907) 745–0222 FAX (907) 746–0222



NOT TO SCALE

Total Cut: 12000 cu yards
Total Fill: 12000 cu yards

Note: Actual channel location may vary depending on soils or bedrock encountered.

Purpose: Restore creek to original channel to re–establish fish passage.

FILE: 0501368RE_ROUTE

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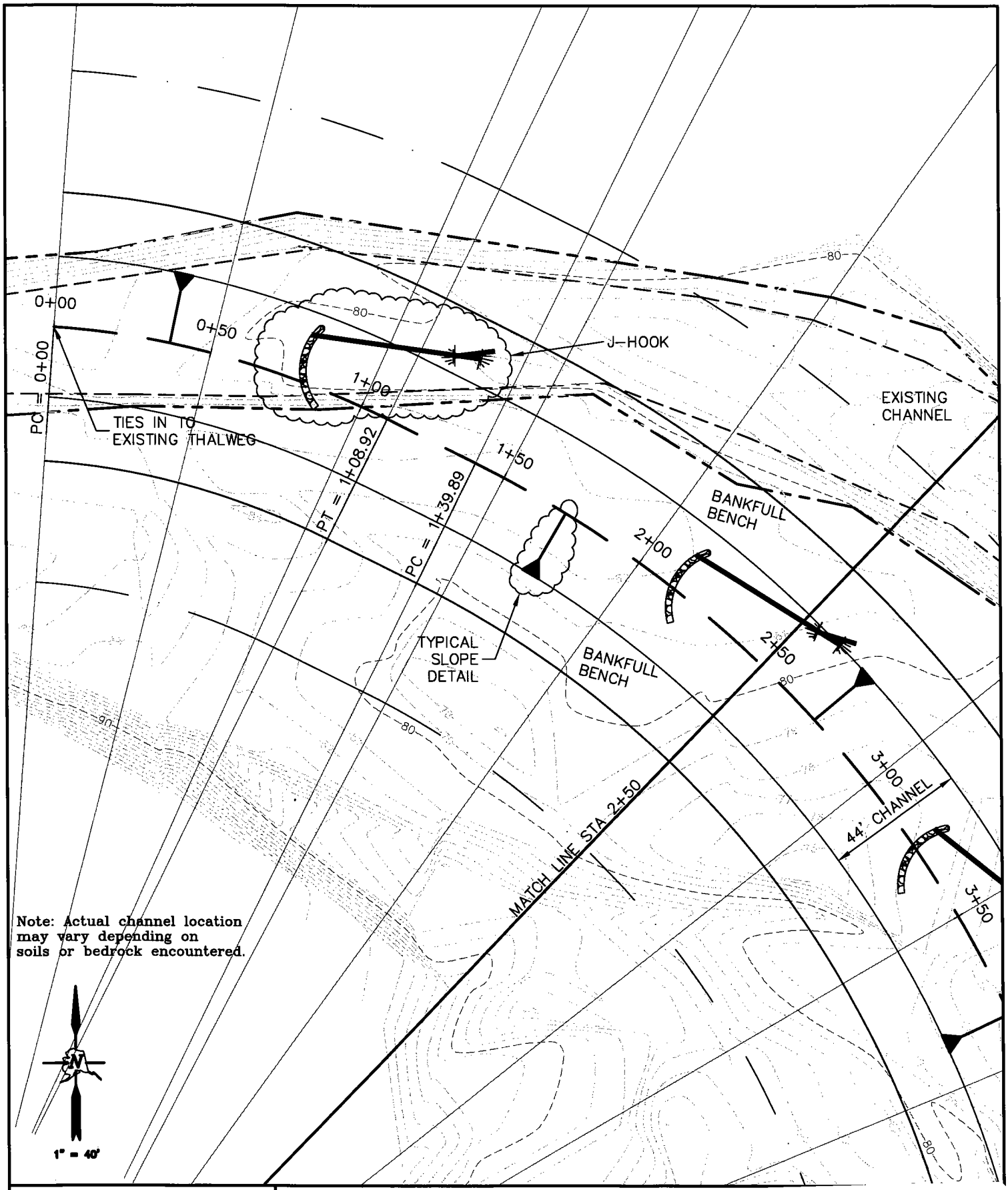
OVERALL PLAN VIEW
MOOSE CREEK
E1/2NE1/4, S
T19N, R2E,

Moose Creek Phase II
Location: Tributary to Matanuska

POA-2005-389-M, Moose Creek
March 1, 2006
Sheet 16 of 36



Note: Actual channel location may vary depending on soils or bedrock encountered.

Purpose: Restore creek to original channel to re-establish fish passage.

FILE: 0501368RE_ROUTE

Page 2 of 19

PL
M00
E1/2NE1/
T19N, R

POA-2005-389-M, Moose Creek
March 1, 2006
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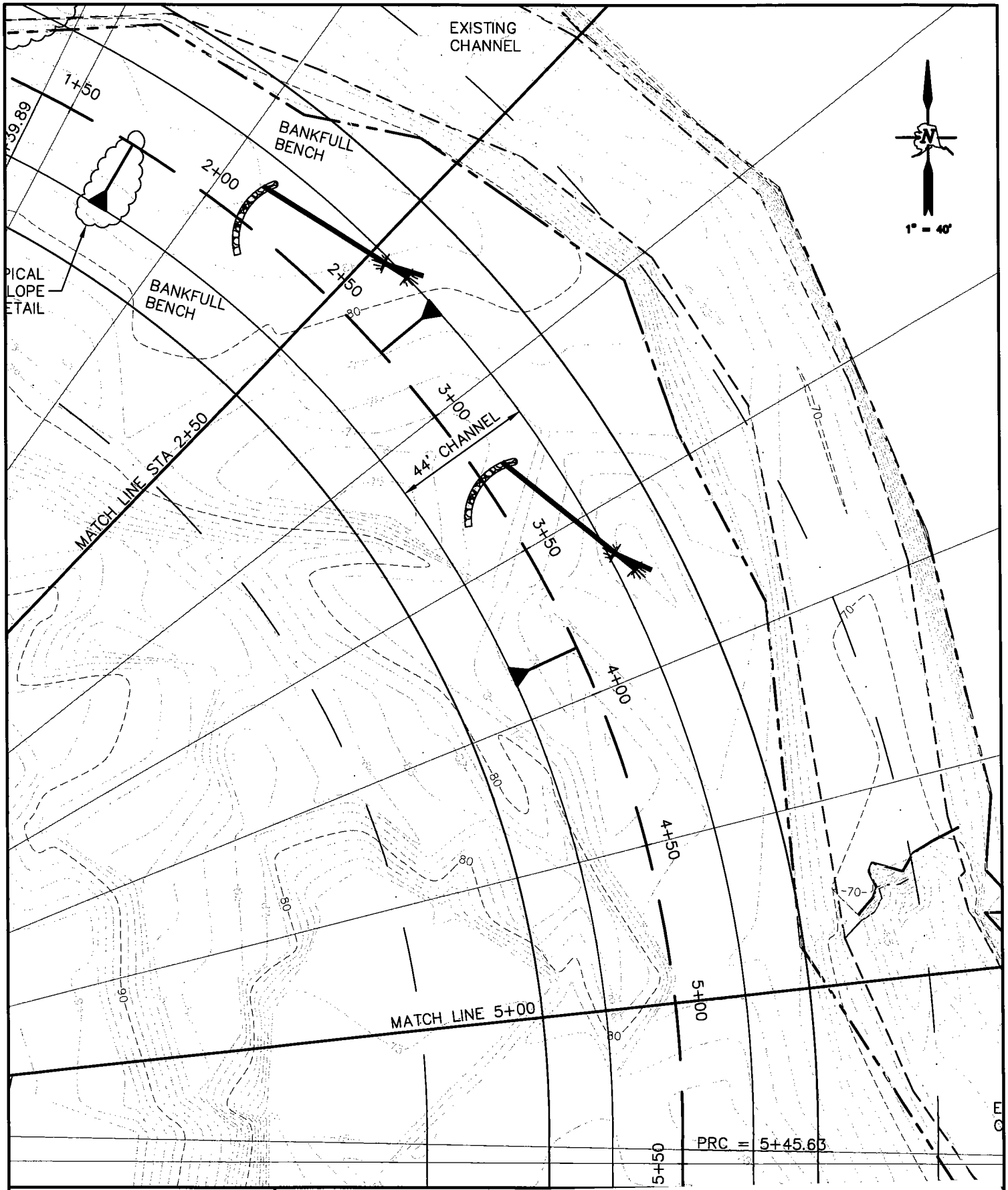

Purpose: Restore creek to original channel to re-establish fish passage.

FILE: 0501368RE_ROUTE

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PL
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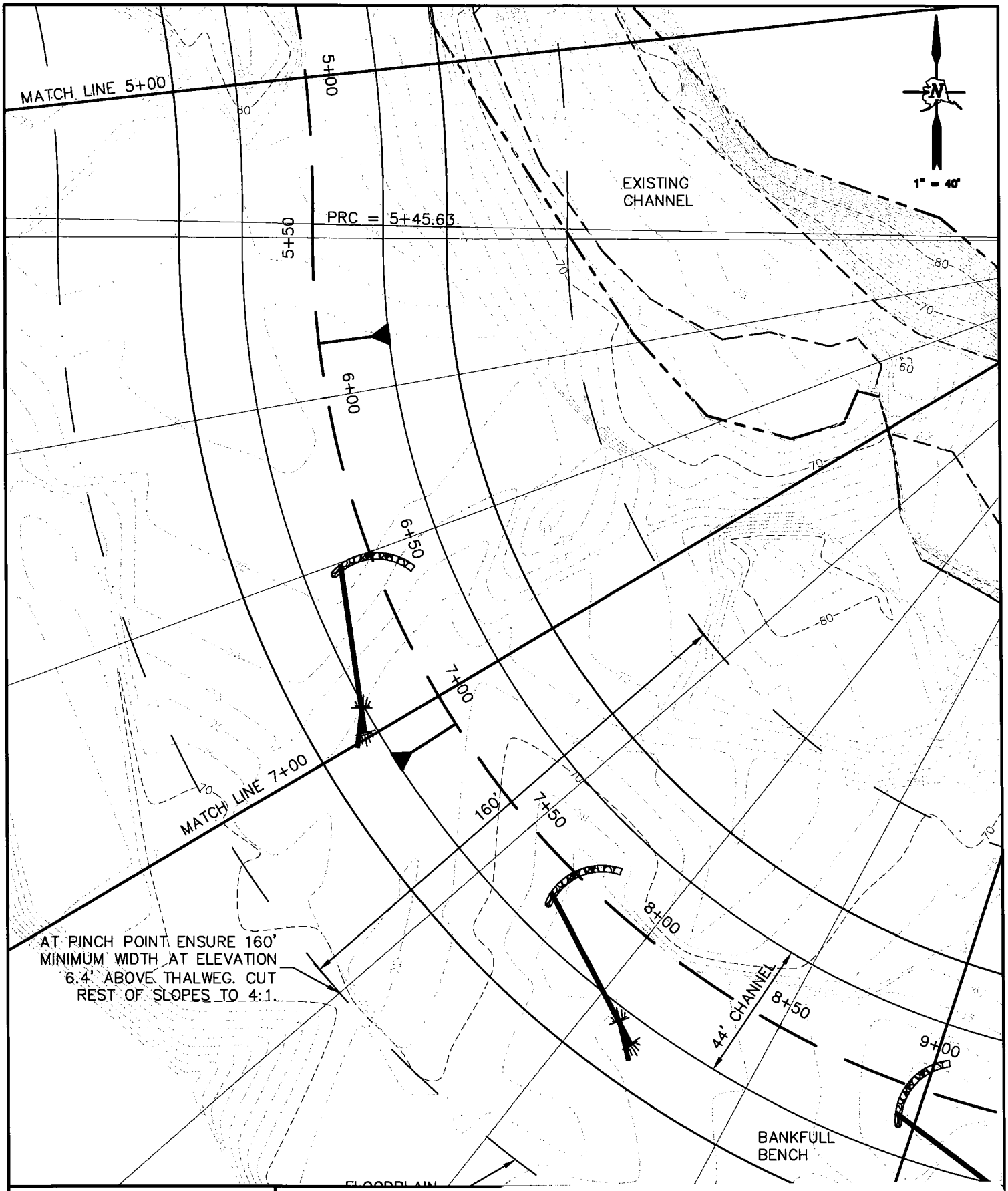
T19N,

POA-2005-389-M, Moose Creek
March 1, 2006
Sheet 18 of 36



Purpose: Restore creek to original channel to re-establish fish passage.

FILE: 0501368RE_ROUTE

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PL
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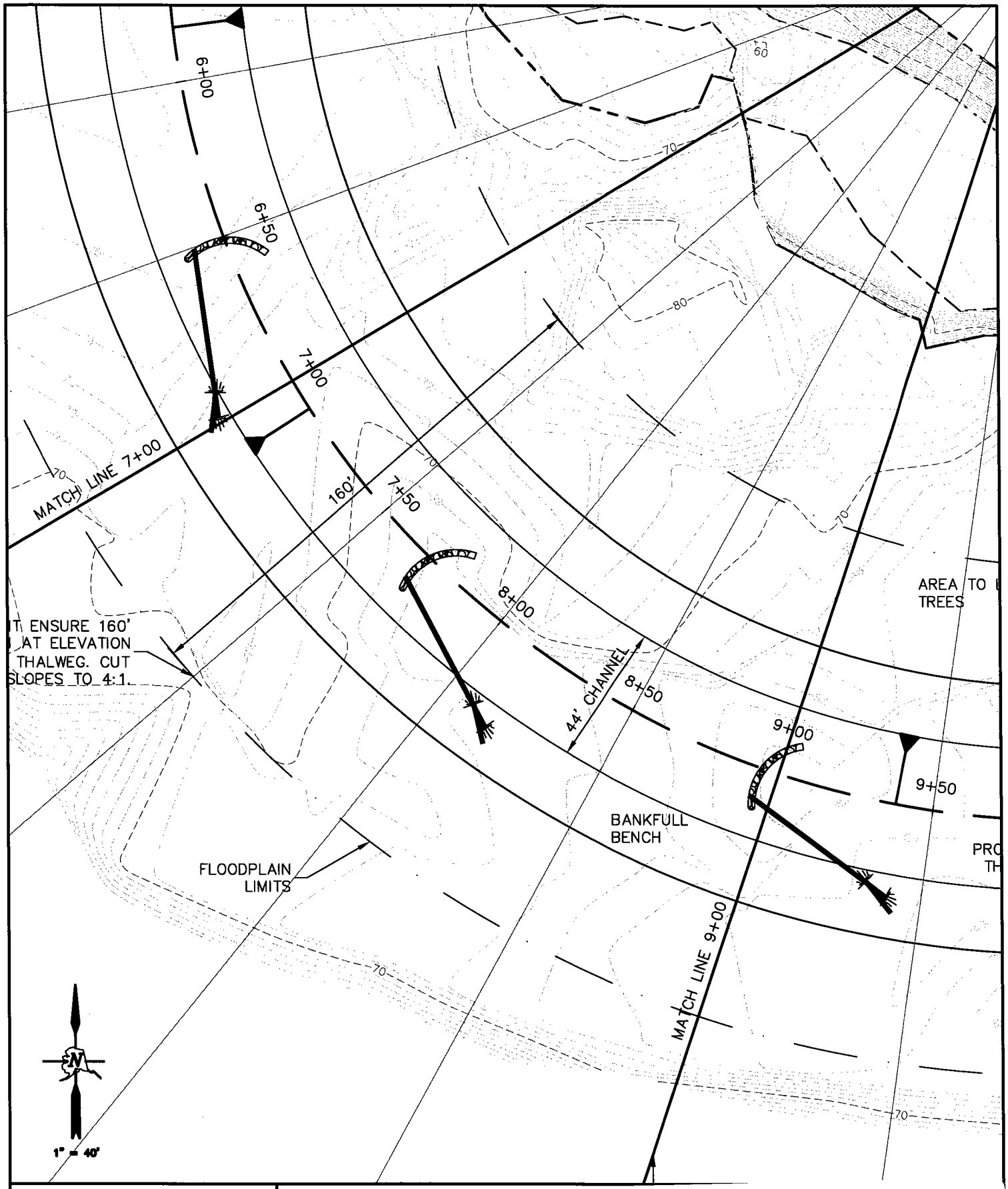
T19N,

POA-2005-389-M, Moose Creek
March 1, 2006
Sheet 19 of 36



Purpose: Restore creek to original channel to re-establish fish passage.

FILE: 0501368RE_ROUTE

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PL.
MOO.
E1/2NE1/
T19N,1

POA-2005-389-M, Moose Creek
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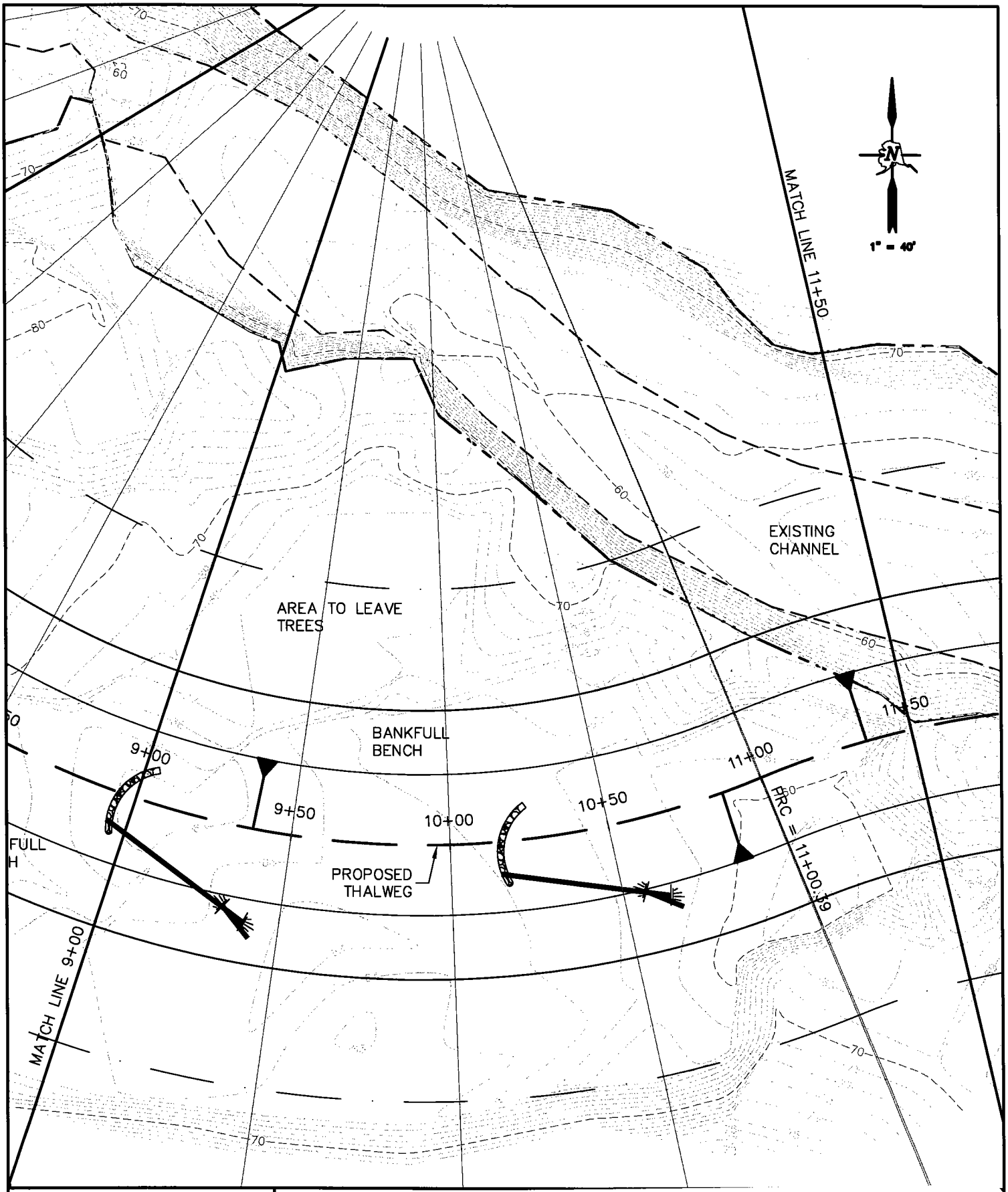

Purpose: Restore creek to original channel to re-establish fish passage.

FILE: 0501368RE_ROUTE

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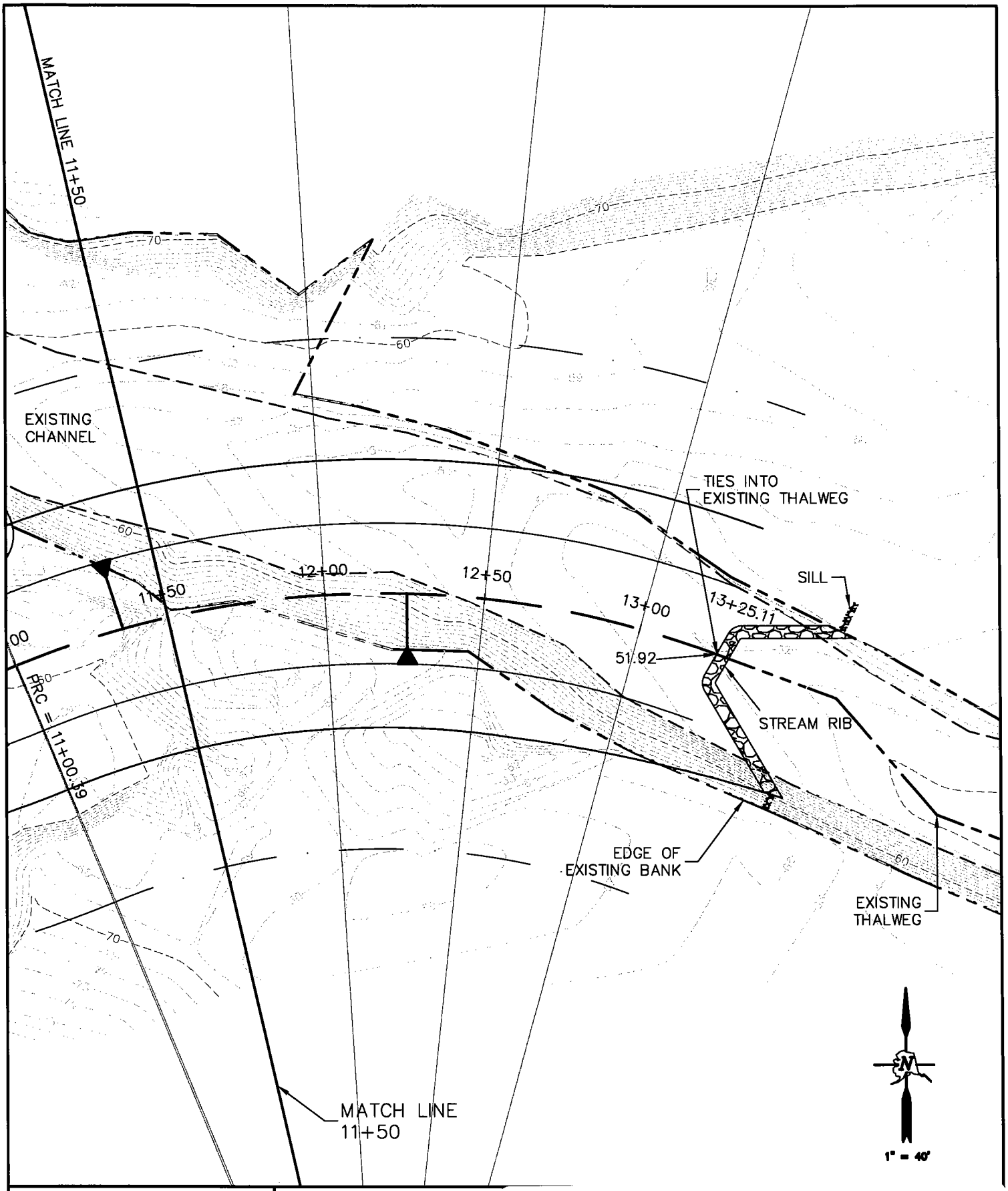
T19N,

POA-2005-389-M, Moose Creek
March 1, 2006
Sheet 21 of 36



Purpose: Restore creek to original channel to re-establish fish passage.

FILE: 0501368RE_ROUTE

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E1/2NE1/
T19N, R

POA-2005-389-M, Moose Creek
March 1, 2006
Sheet 22 of 36

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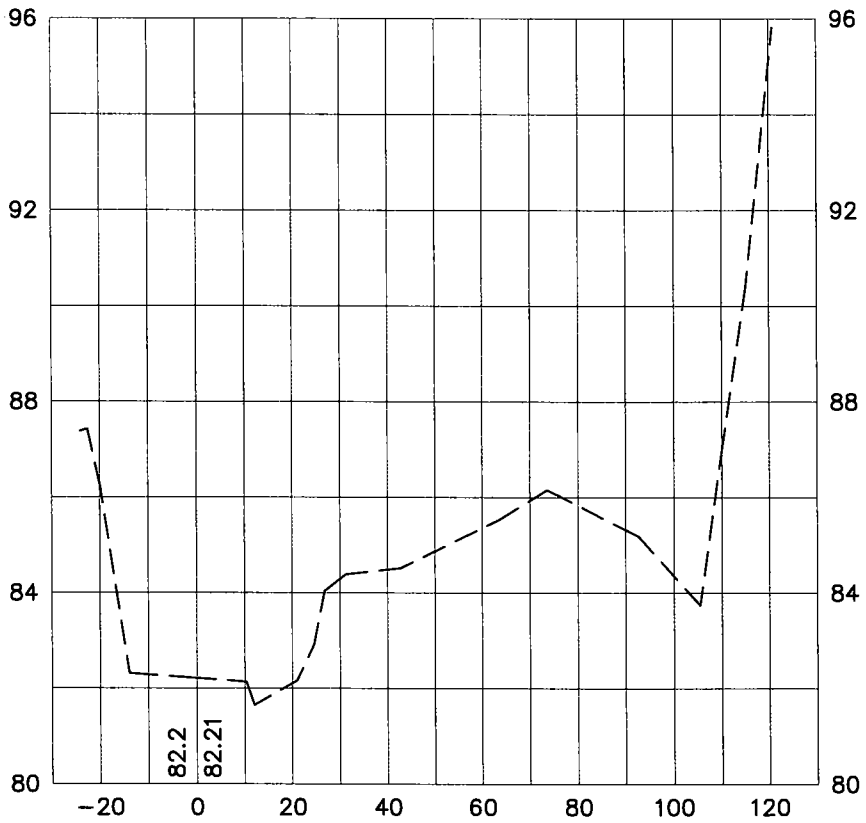

CROSS SECTIONS LEGEND:

— — — — =EXISTING GROUND CONDITIONS

——— =PROPOSED CHANNEL

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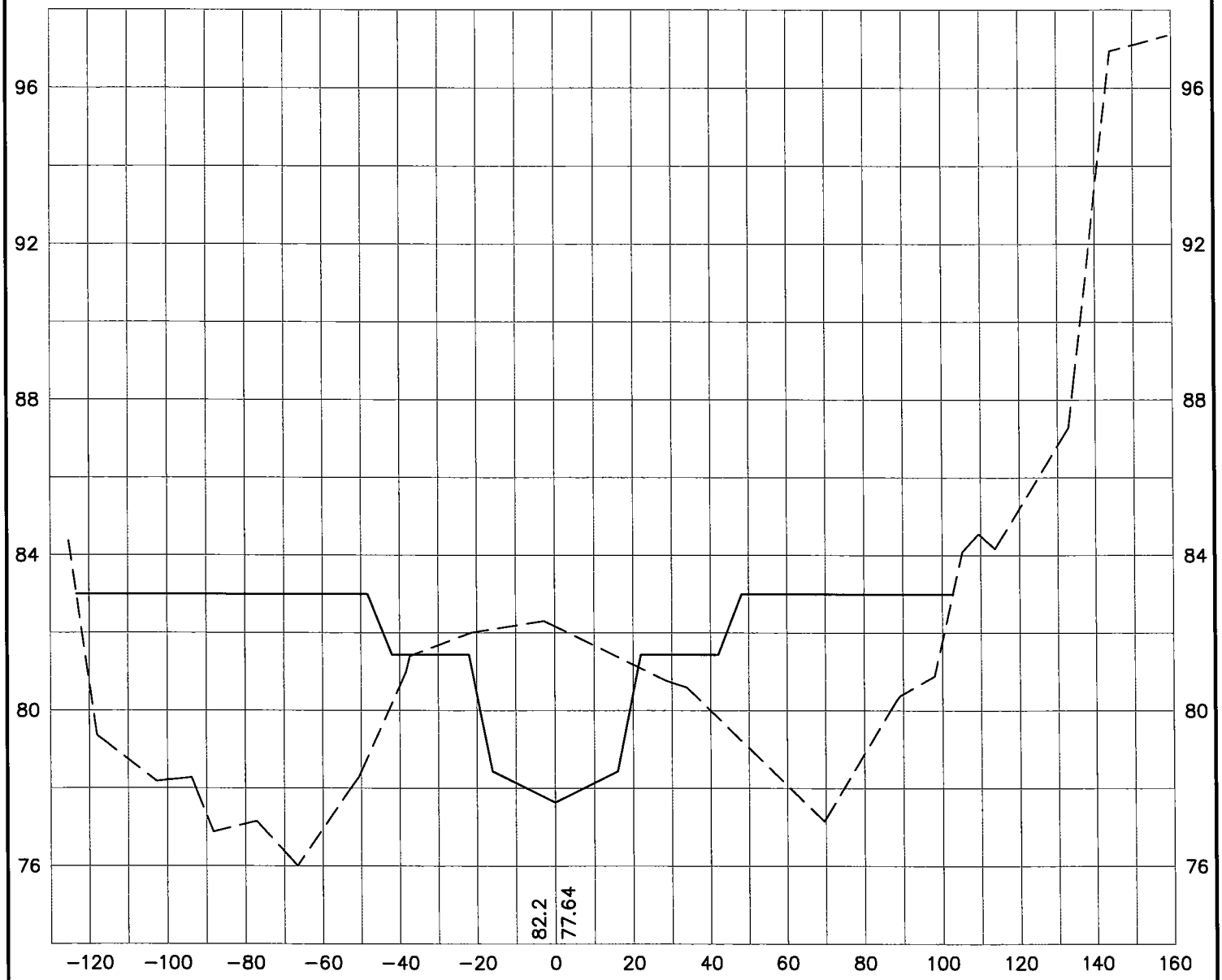
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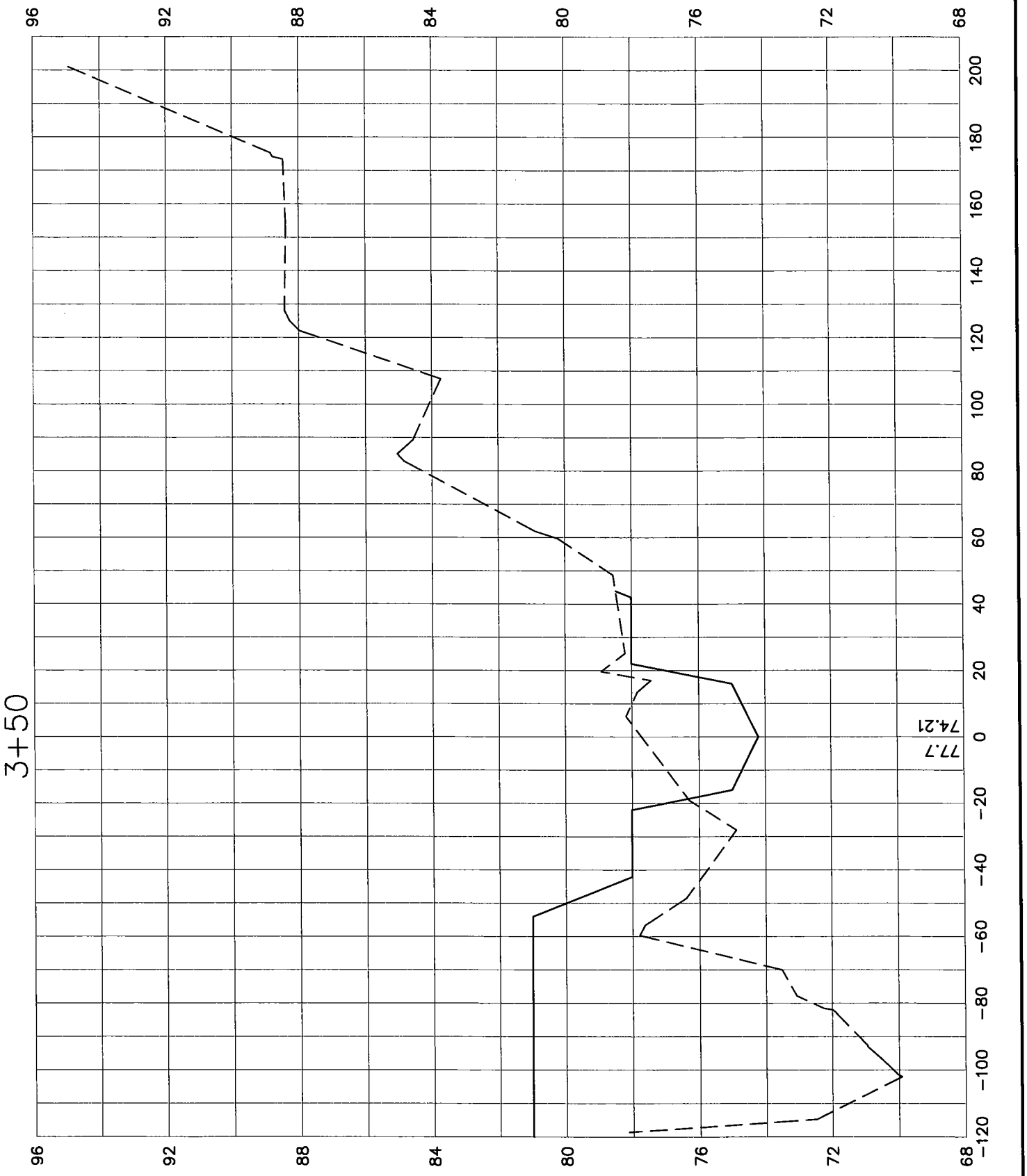

POA-2005-389-M, Moose Creek
March 1, 2006
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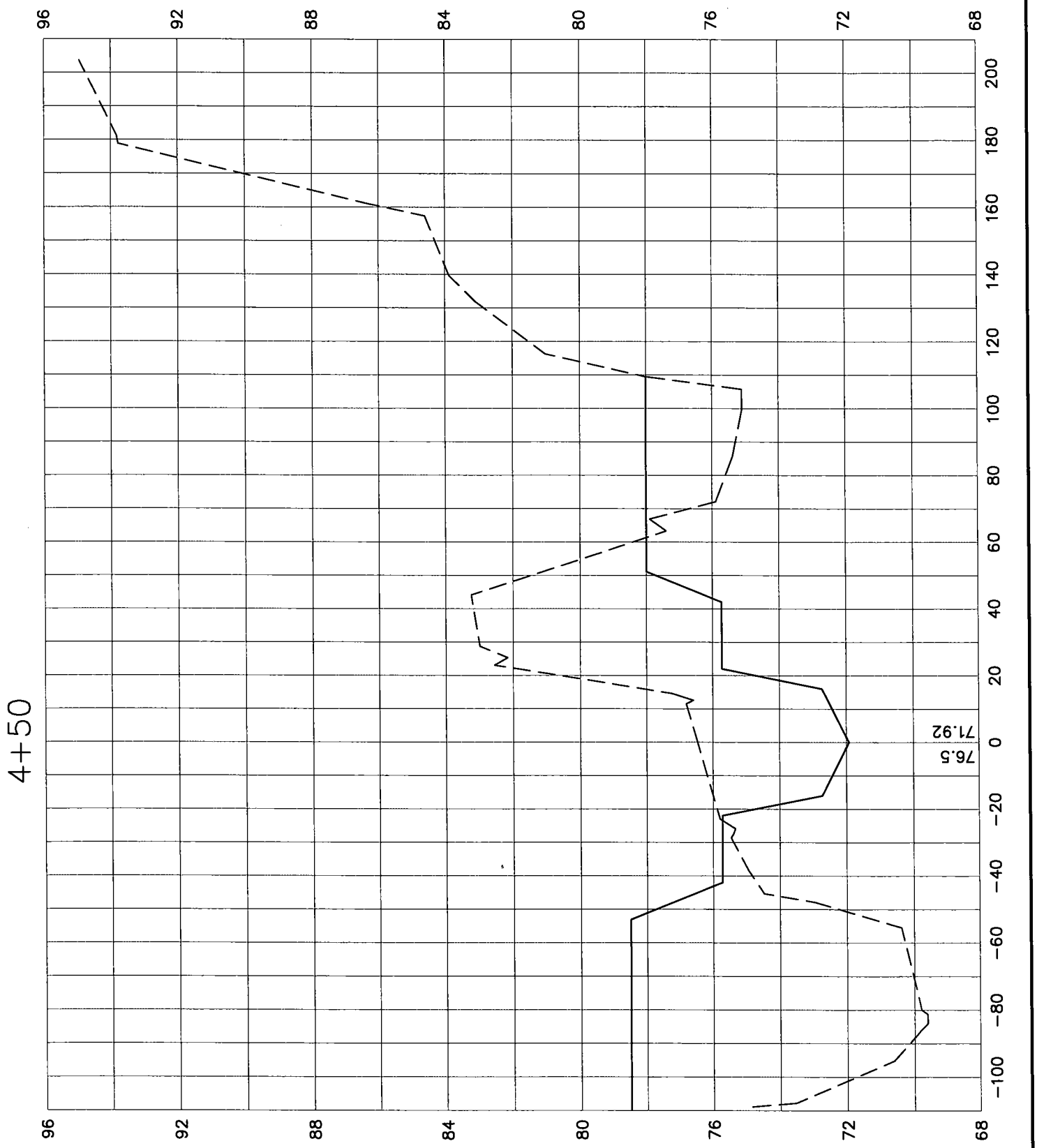

POA-2005-389-M, Moose Creek
March 1, 2006
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FILE: 0501368RE_ROUTE
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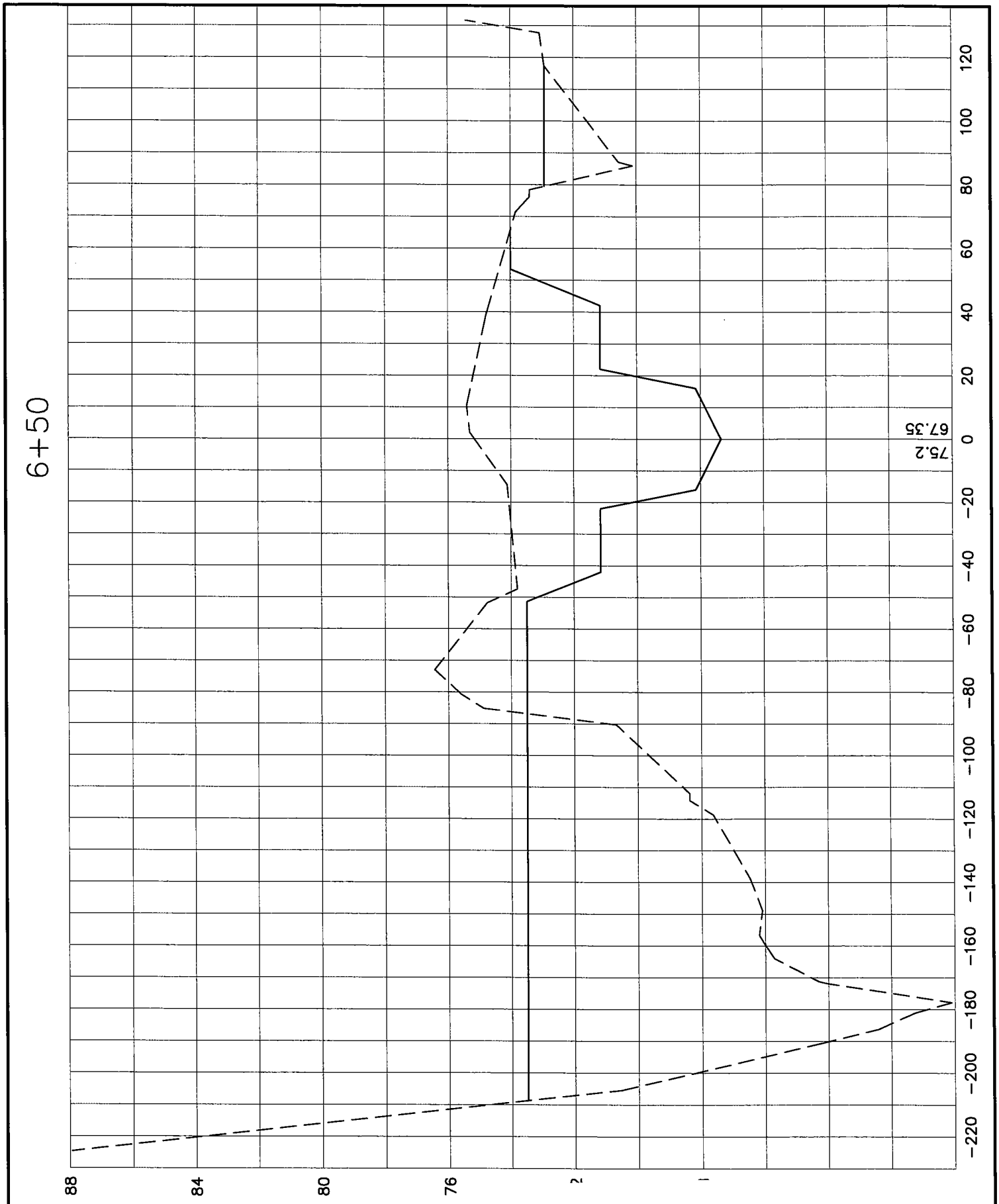

POA-2005-389-M, Moose Creek
March 1, 2006
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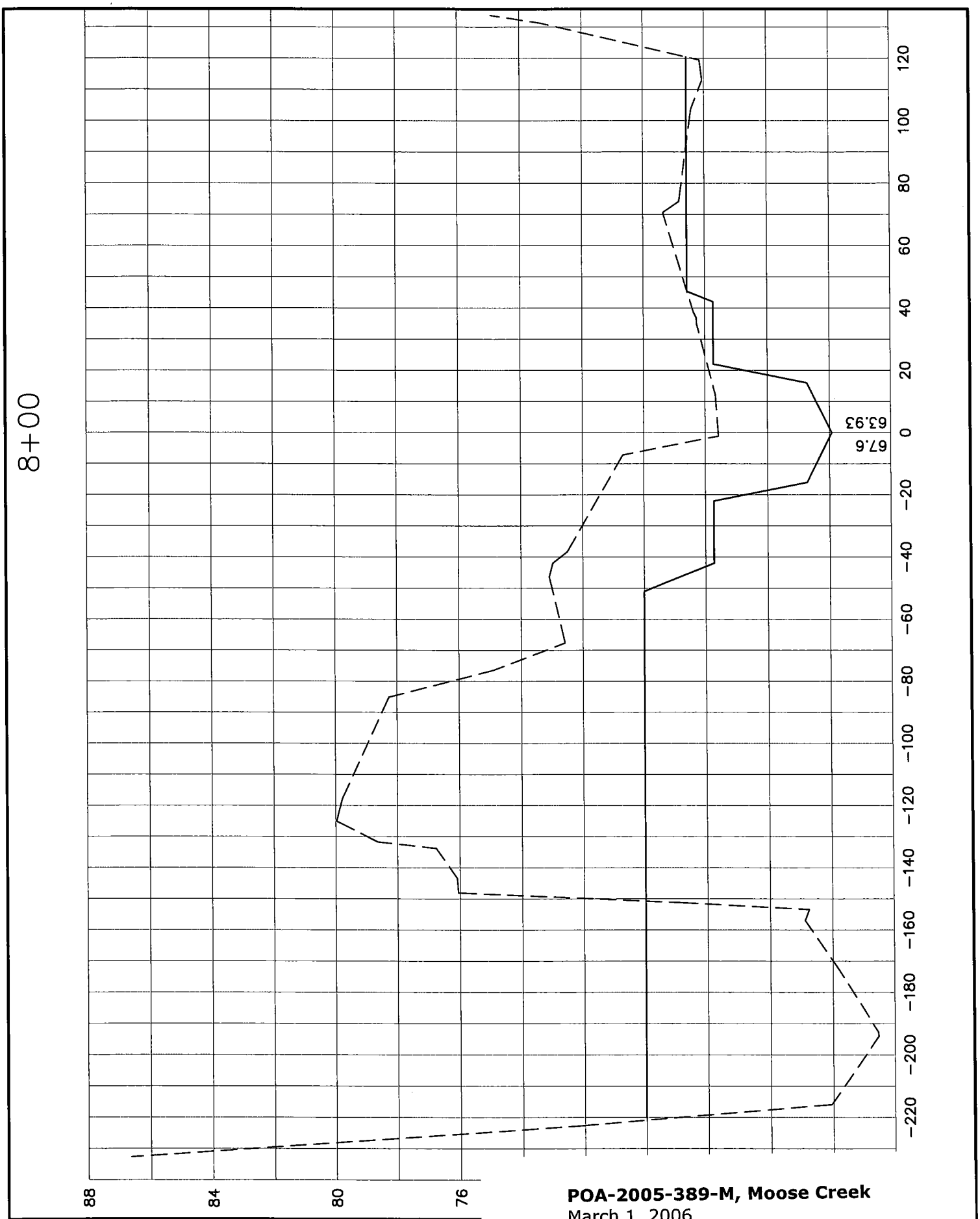

POA-2005-389-M, Moose Creek
March 1, 2006
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FILE: 0501368RE_ROUTE
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CROSS
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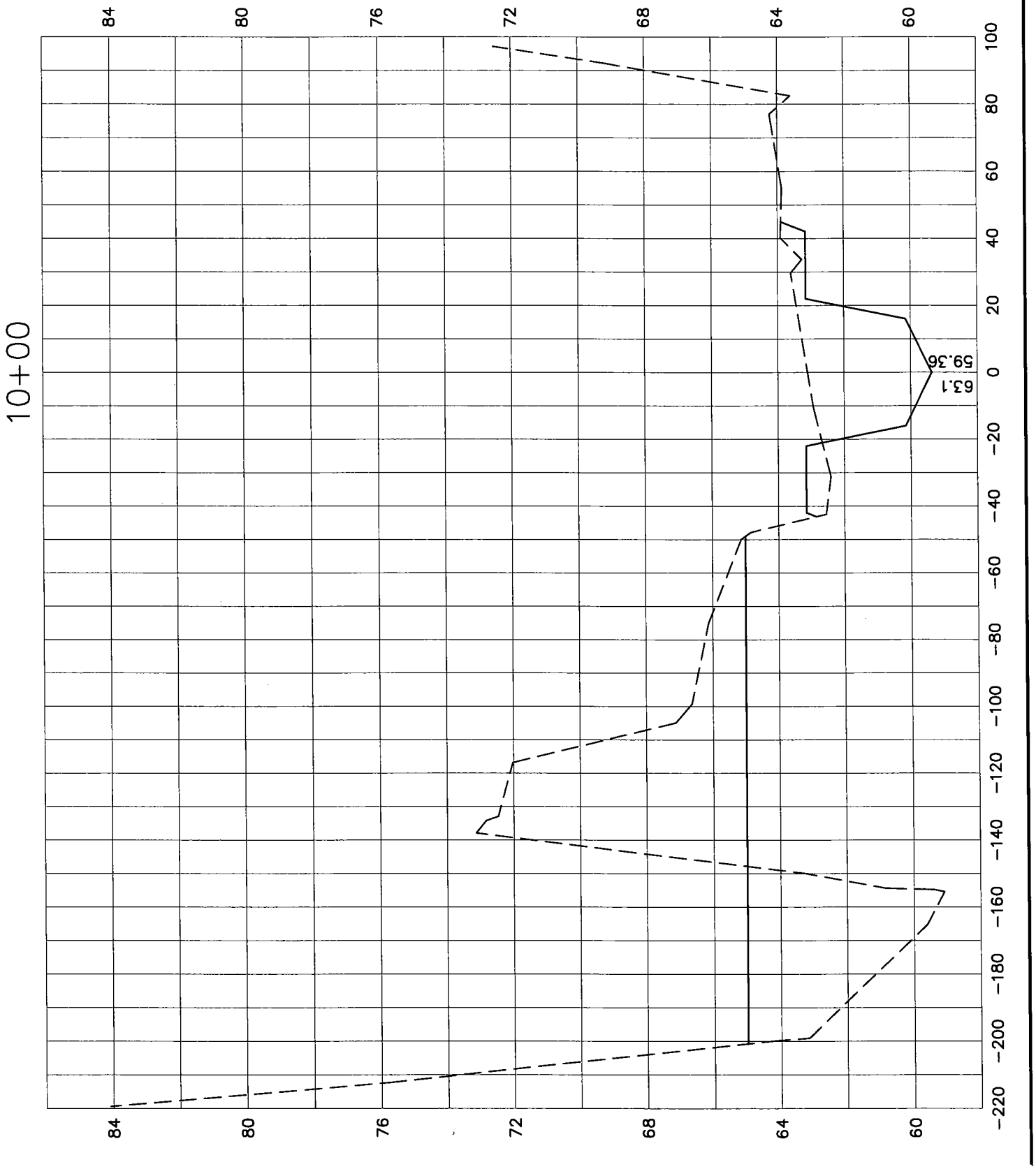

POA-2005-389-M, Moose Creek
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CROSS
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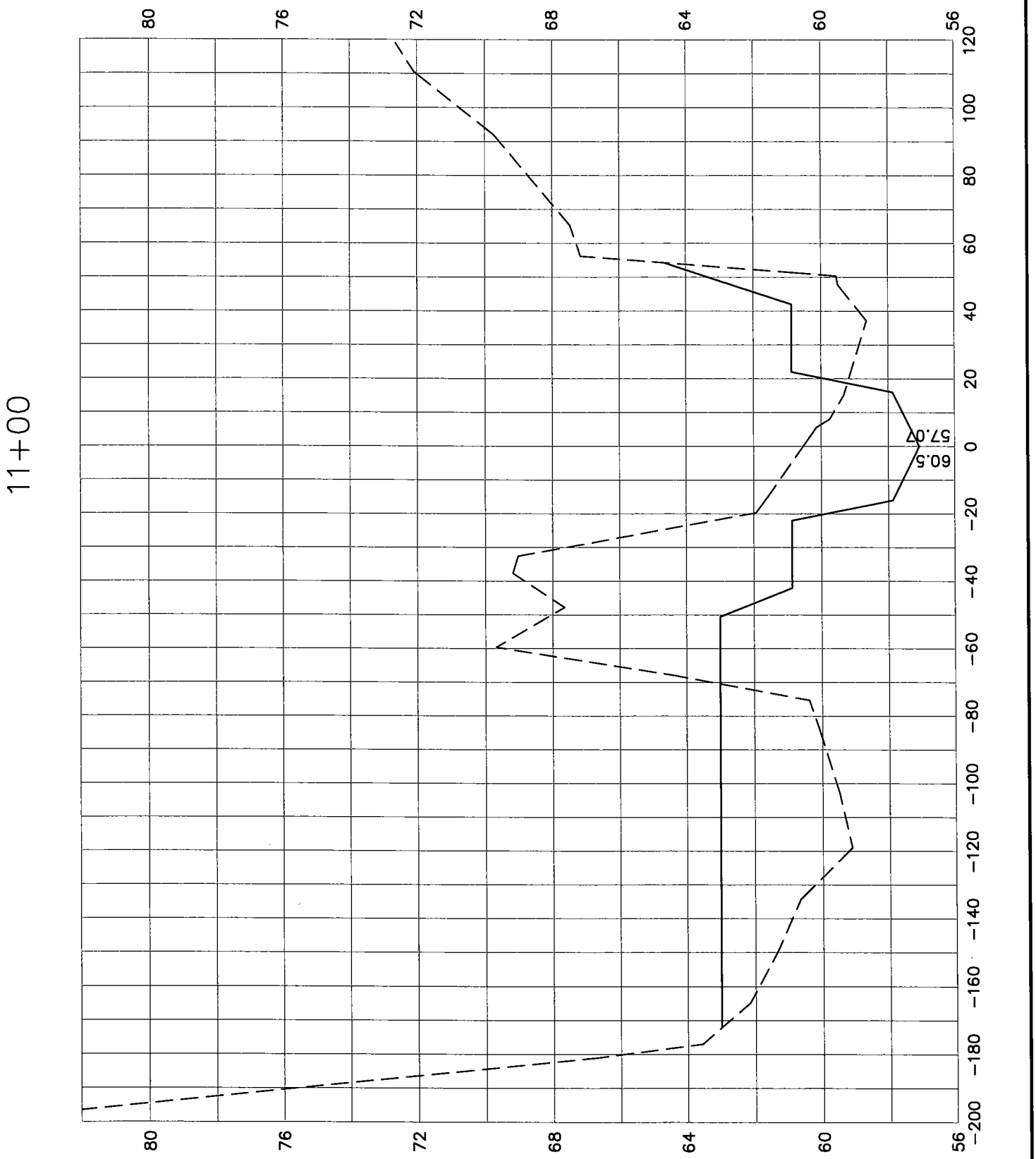

POA-2005-389-M, Moose Creek
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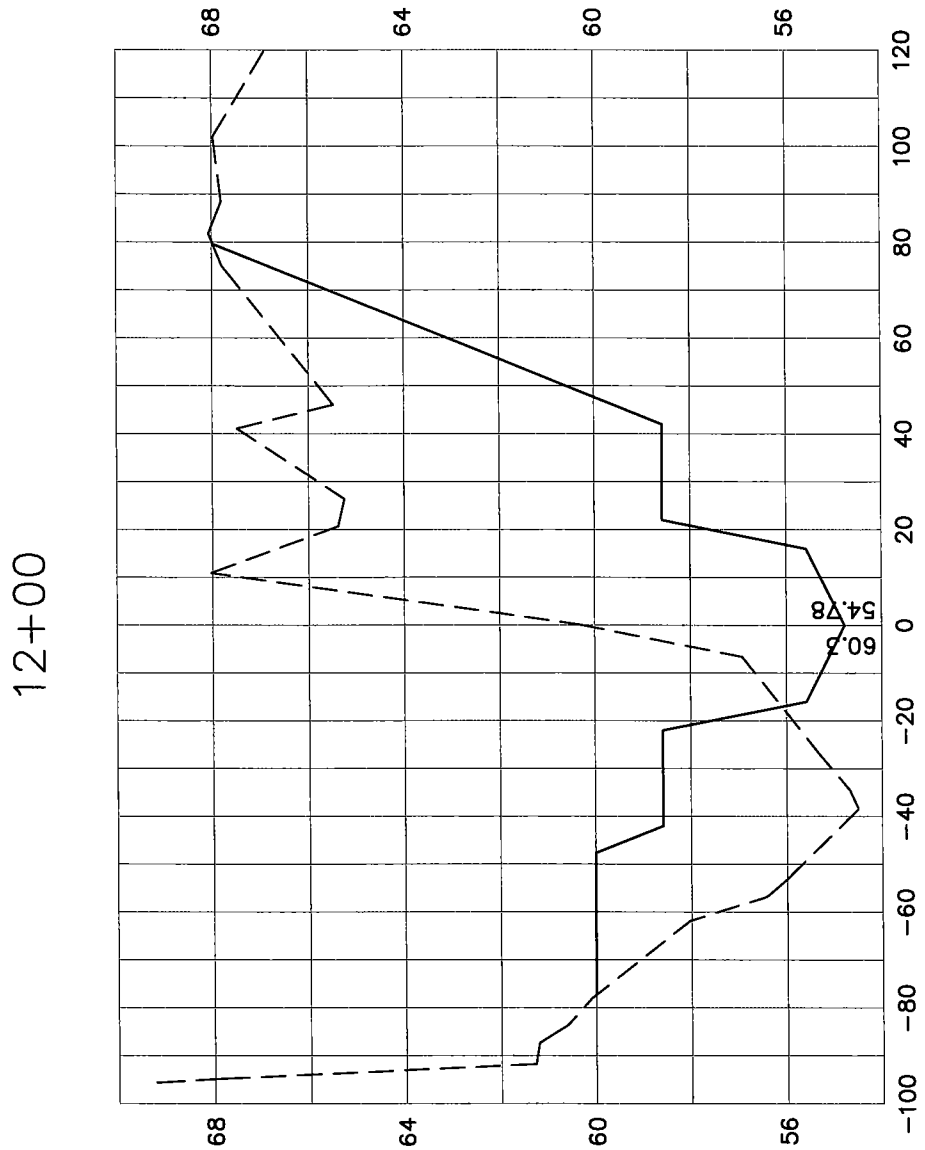
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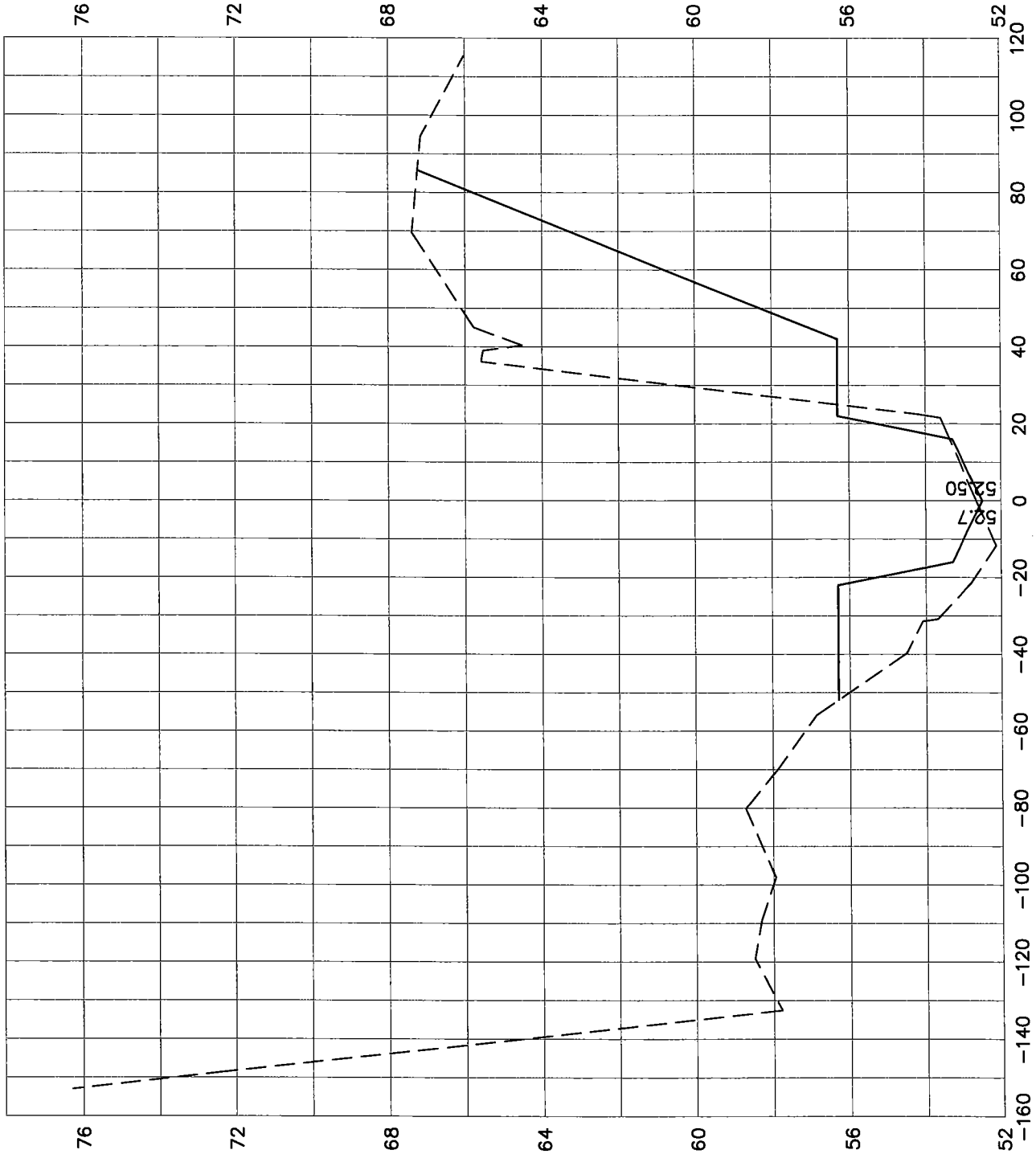
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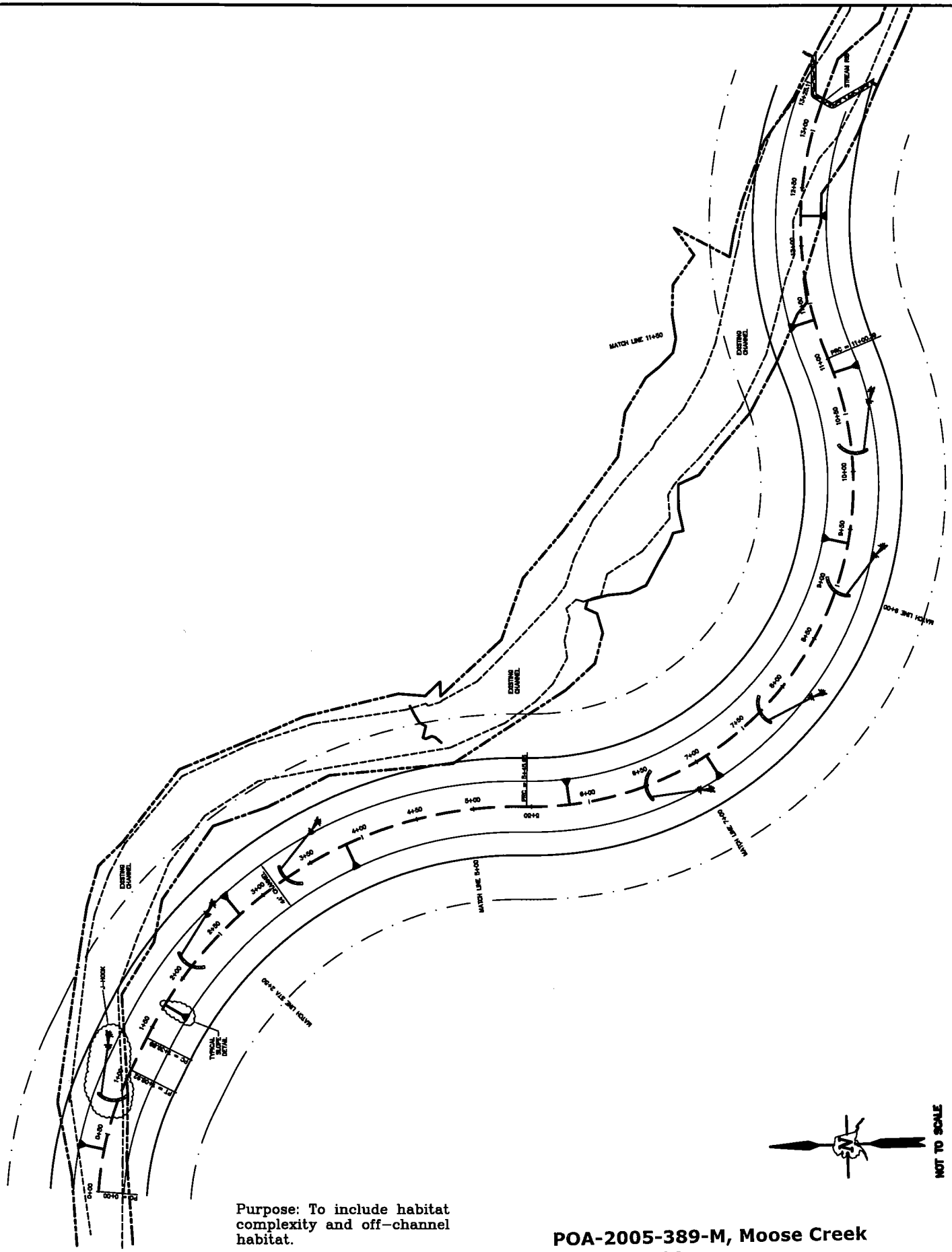

Purpose: To include habitat complexity and off-channel habitat.

POA-2005-389-M, Moose Creek
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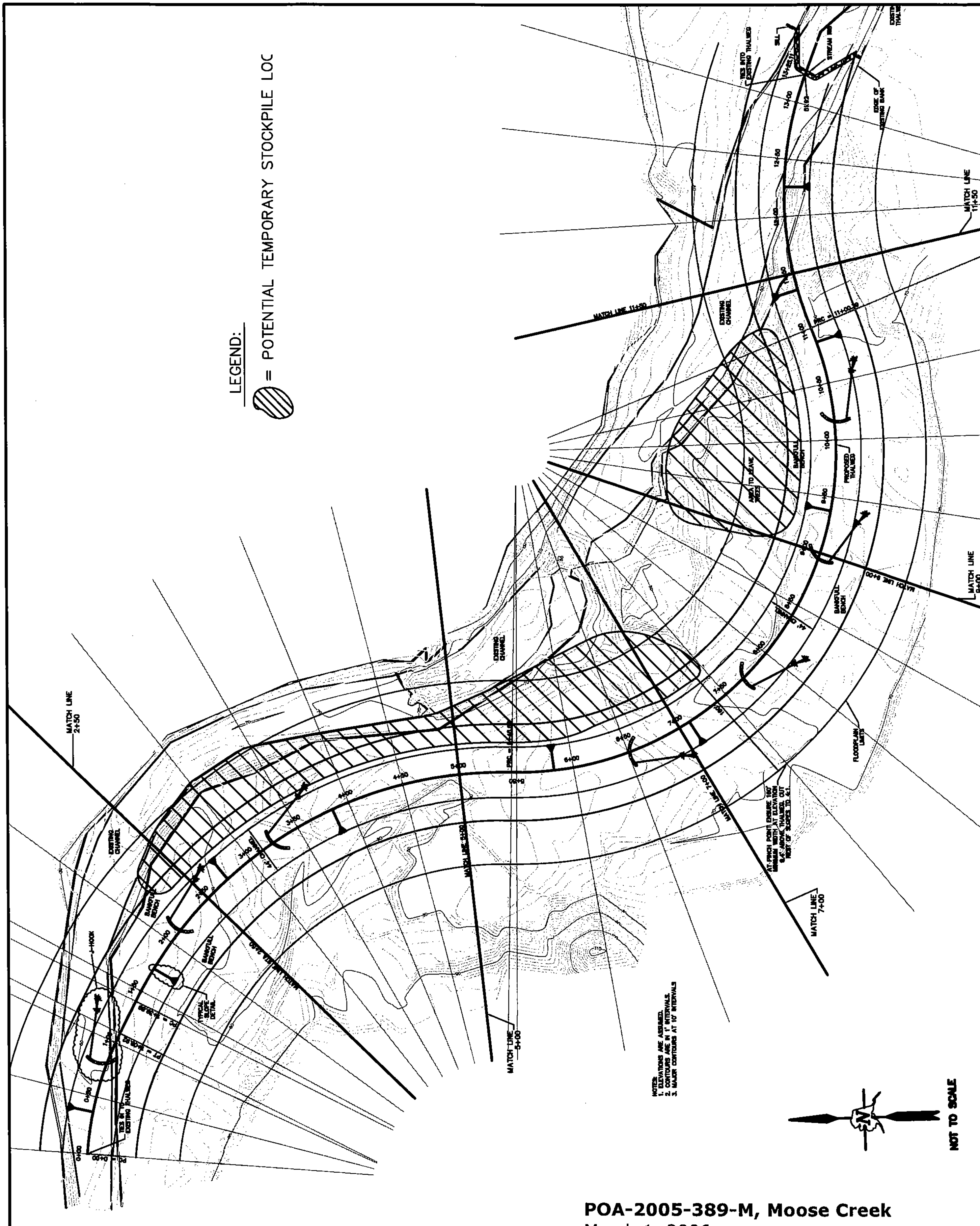
POTENT
ENHANCEM



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TEMPORA
LO

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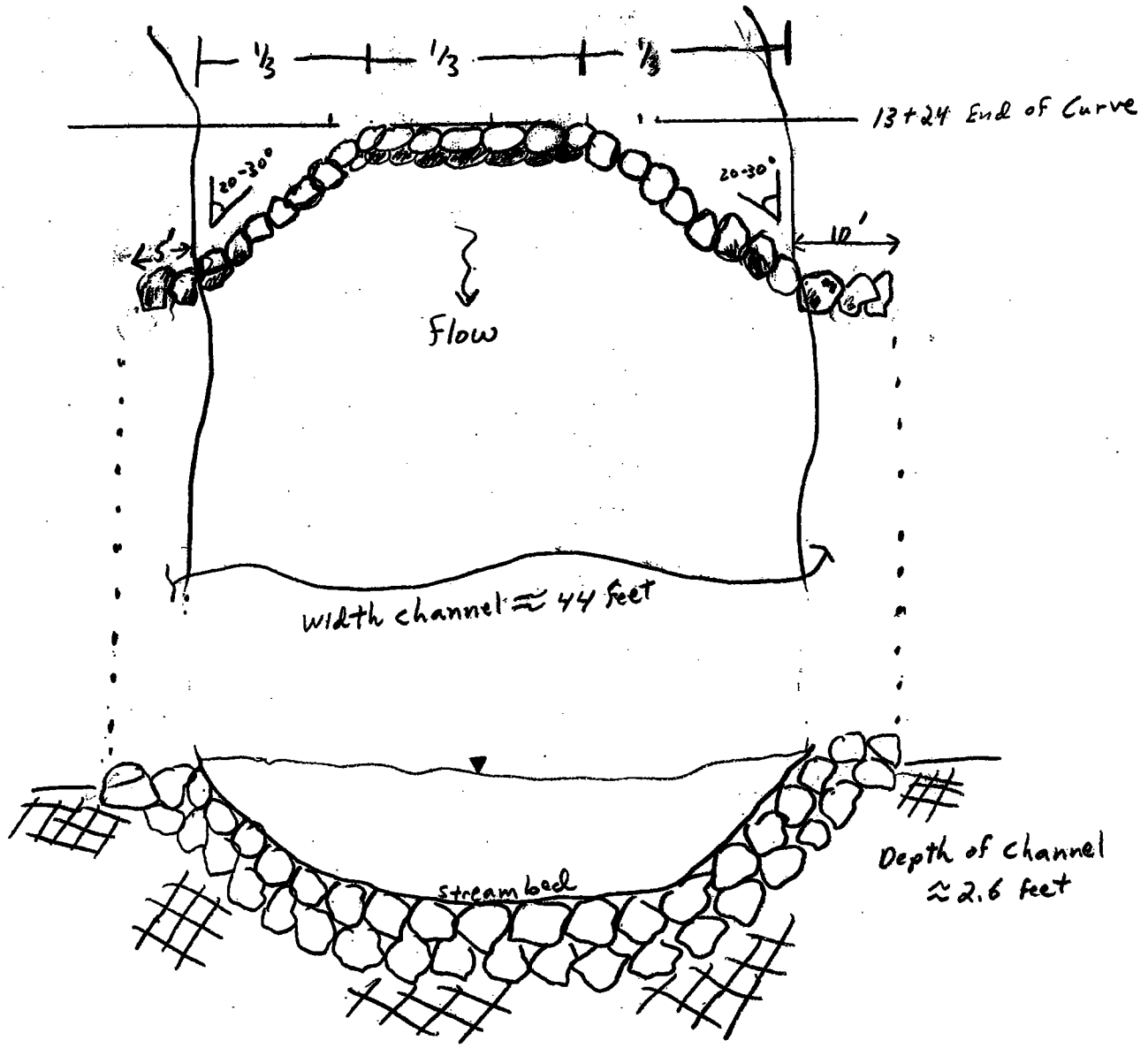
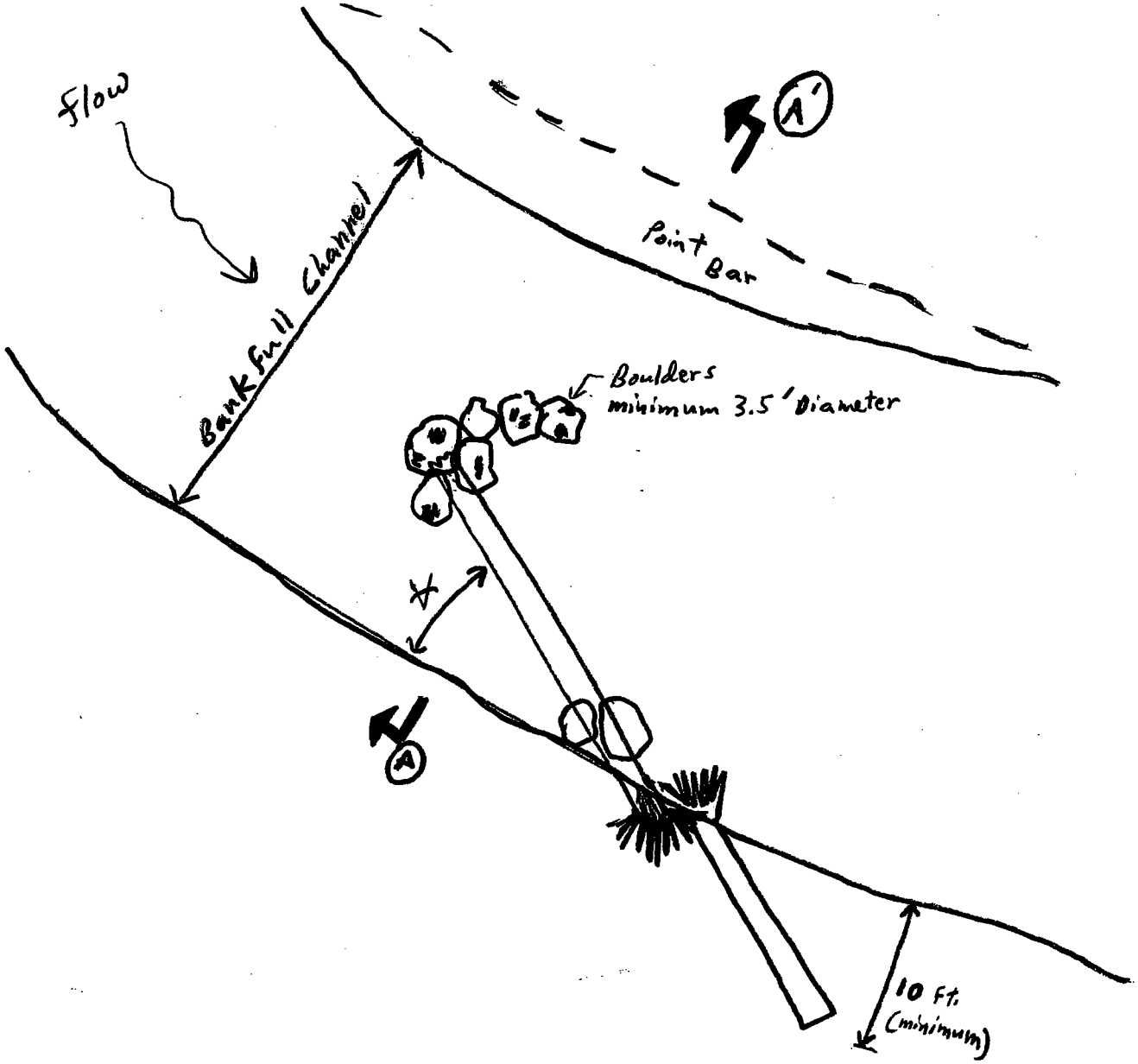
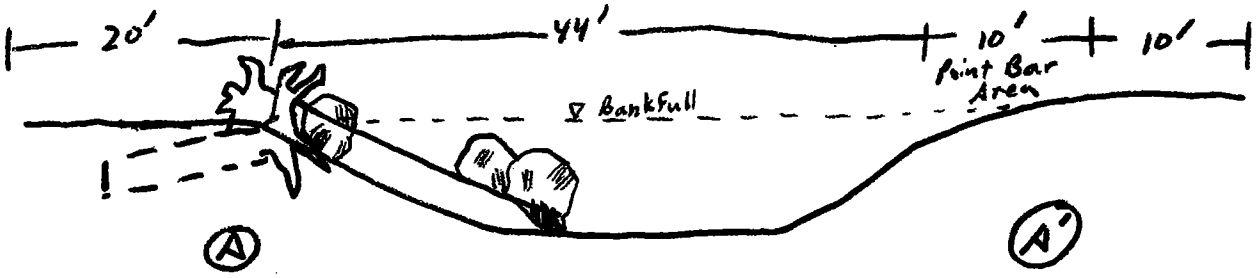
2006	Typical: Stream Rib	3/2/06



- Depth of Rib: 6 Feet
- Size of Boulders: 3-4 feet Diameter
- Rib follows top of streambed
- One Rib expected to be constructed, at downstream end of project.
- Location and Layout of Structure (Final) will be field determined.

	Moose Creek Phase II J-Hook Vane (Typical)	Bill Rice - FWS 3/6/06





General notes

1) Vane will extend into channel a total of 1/4 of the bankfull width and angled from the streambank between 20° to 3

2) The top of the vane shall have a slope

FRANK H. MURKOWSKI, GOVERNOR

STATE OF ALASKA

OFFICE OF THE GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION

DIVISION OF WATER
401 Certification Program
Non-Point Source Water Pollution Control Program

NOTICE OF APPLICATION
FOR
STATE WATER QUALITY CERTIFICATION

Any applicant for a federal license or permit to conduct an activity that might result in a discharge into navigable waters, in accordance with Section 401 of the Clean Water Act of 1977 (PL95-217), also must apply for and obtain certification from the Alaska Department of Environmental Conservation that the discharge will comply with the Clean Water Act, the Alaska Water Quality Standards, and other applicable State laws. By agreement between the U.S. Army Corps of Engineers and the Department of Environmental Conservation, application for a Department of the Army permit to discharge dredged or fill material into navigable waters under Section 404 of the Clean Water Act also may serve as application for State Water Quality Certification.

Notice is hereby given that the application for a Department of the Army Permit described in the Corps of Engineers' Public Notice No. **POA-2005-389-M, Moose Creek**, State Water Quality Certification from the Department of Environmental Conservation.

After reviewing the application, the Department may certify that there is reasonable assurance that the activity, and any discharge that might result, will comply with the Clean Water Act, the Alaska Water Quality Standards, and other applicable State laws. The Department also may deny or waive certification.

Any person desiring to comment on the project with respect to Water Quality Certification may submit written comments within 30 days of the date of the Corps of Engineer's Public Notice to:

Department of Environmental Conservation
WQM/401 Certification
555 Cordova Street
Anchorage, Alaska 99501-2617
Telephone: (907) 269-6281
FAX: (907) 269-7508

Attachment #1

FRANK H. MURKOWSKI, GOVERNOR

STATE OF ALASKA

OFFICE OF THE GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF PROJECT MANAGEMNT AND PERMITTING

ALASKA COASTAL ZONE MANAGEMENT
550 WEST 7TH AVENUE, SUITE 1660
ANCHORAGE, ALASKA 99501-3568

NOTICE OF APPLICATION
FOR
CERTIFICATION OF CONSISTENCY WITH THE
ALASKA COASTAL MANAGEMENT PROGRAM

Notice is hereby given that a request is being filed with the Office of Project Management and Permitting for a consistency determination, as provided in Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended [16 U.S.C. 1456(c)(3)], that the project described in the Corps of Engineers Public Notice No. **POA-2005-389-M, Moose Creek**, will comply with the Alaska Coastal Management Program and that the project will be conducted in a manner consistent with that program.

The Office of Project Management and Permitting requests your comments, particularly on the proposed project's consistency with the affected local coastal district management program. For more information on the consistency review contact OPMP at (907) 269-7470 or (907) 465-3562, or visit the ACMP web site at http://www.gov.state.ak.us/gdc/Projects/projects.html.

Attachment #2